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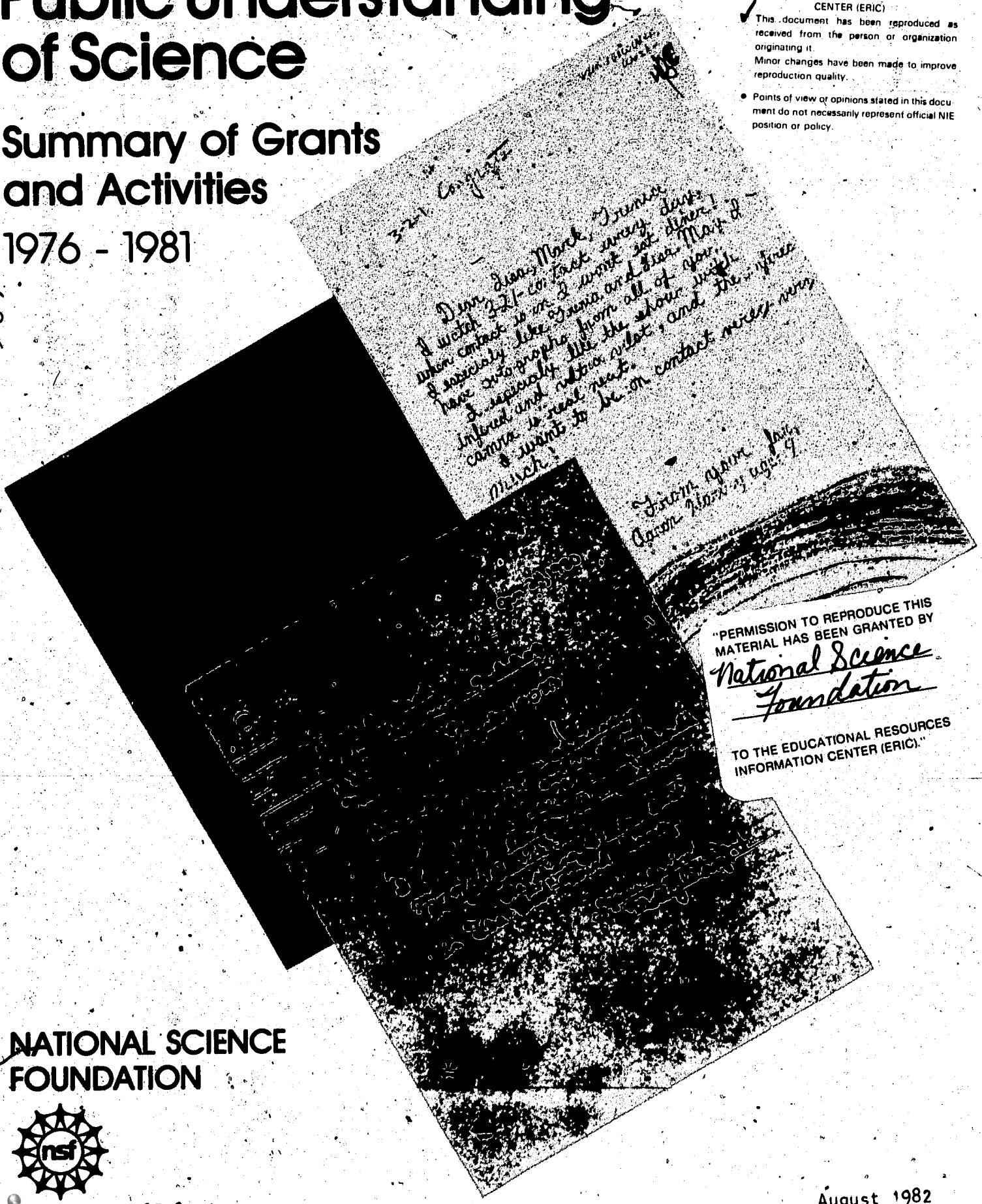
ABSTRACT

The Public Understanding of Science Program (PUOS) was formed in 1957 to help improve popular awareness and understanding of the role, activities, methods, and implications of science. The first section of this document highlights the role and purpose of the PUOS program, summarizing the need for informal science education, PUOS strategy, the review process, preliminary proposals, evaluation, content control, advocacy, and first amendment protection, followed by summaries of PUOS activities in broadcasting, museums, journalism, and conferences. Lists of PUOS review panel members and grants awarded are also included. Title, amount of award, project description, and either name of grantee (or current contact person) are provided for each grant listed. (Author/JN)

Public Understanding of Science

Summary of Grants and Activities

1976 - 1981



NATIONAL SCIENCE FOUNDATION

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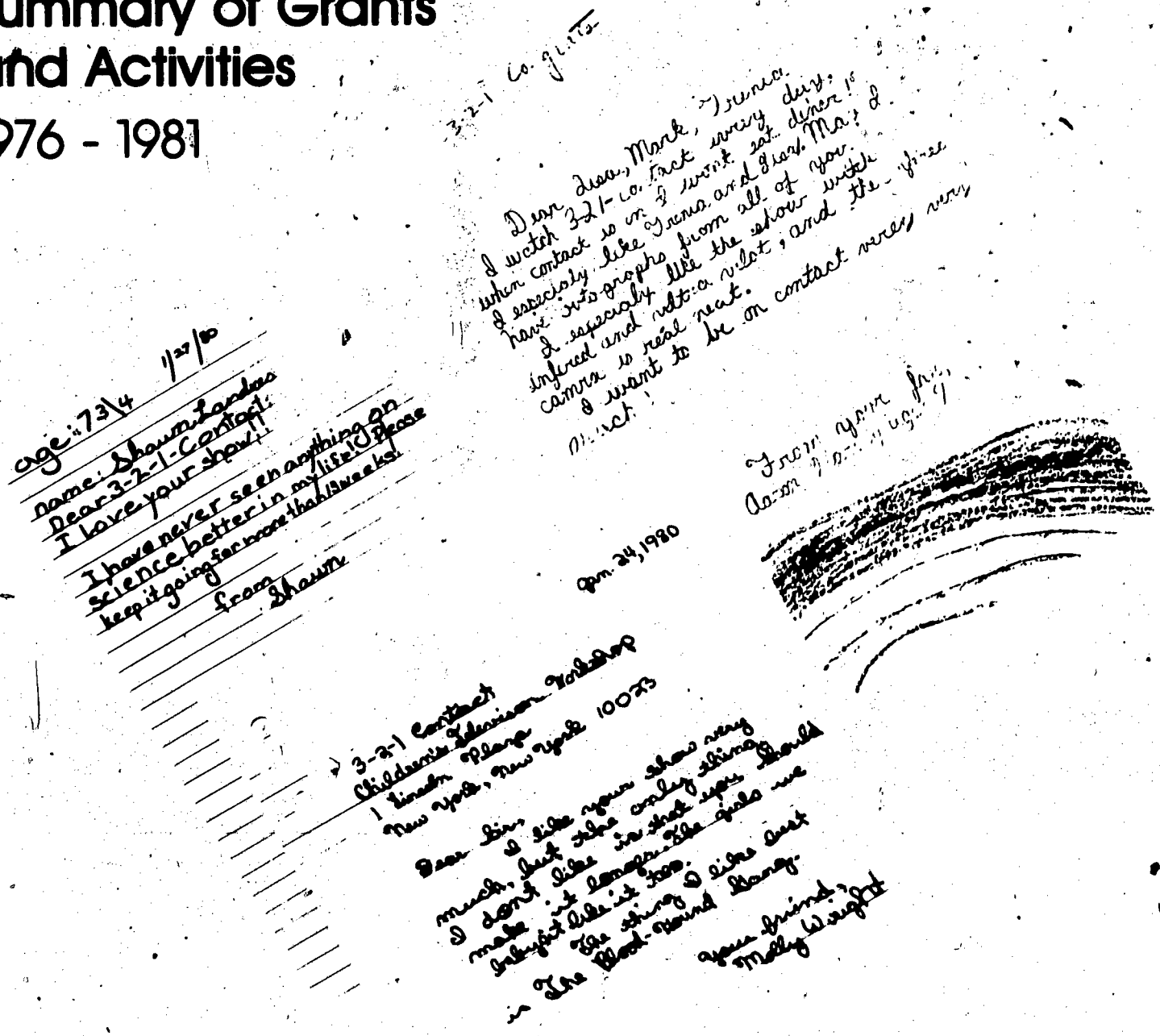


NATIONAL SCIENCE FOUNDATION

SUMMARY OF GRANTS AND ACTIVITIES PUBLIC UNDERSTANDING OF SCIENCE PROGRAM NATIONAL SCIENCE FOUNDATION FY 1976-1981

For over twenty years, the National Science Foundation has maintained a program to help the public learn about and understand the activities of science and technology. Although the organizational setting varied from time to time, most of the early activities concerned scientists and discussions of what they thought should be communicated to the public.

In 1976 the strategy shifted significantly, focusing on practical communication activities and means to serve different audiences, while continuing to emphasize the quality and accuracy of content. The Public Understanding of Science Program has been increasingly successful in meeting this objective and reaching large audiences and a broad spectrum of the public.

To accomplish this, the program has established a number of policies that have significance to issues of government communication practice, "first amendment" independence of communication media, cooperation with the private sector, proposal review and interagency cooperation.

This program strategy is relevant both to organizations that are directly affected, such as science museums and public broadcasting; and also to anyone with interest in the techniques and support of informal education and public-interest communication.

The Role and Purpose of the Public Understanding of Science Program

The Public Understanding of Science Program (PUOS) was formed in 1957 to help improve popular awareness and understanding of the role, activities, methods and implications of science. Since then the program has acquired increasing sophistication in meeting this goal, and during the past six years it has largely focussed on activities that reach a broad spectrum of the public, with audiences of millions rather than highly motivated groups that are reasonably well served without government intrusion.

The need for such communication is critical. Society today is vitally dependent upon technology and scientific understanding.

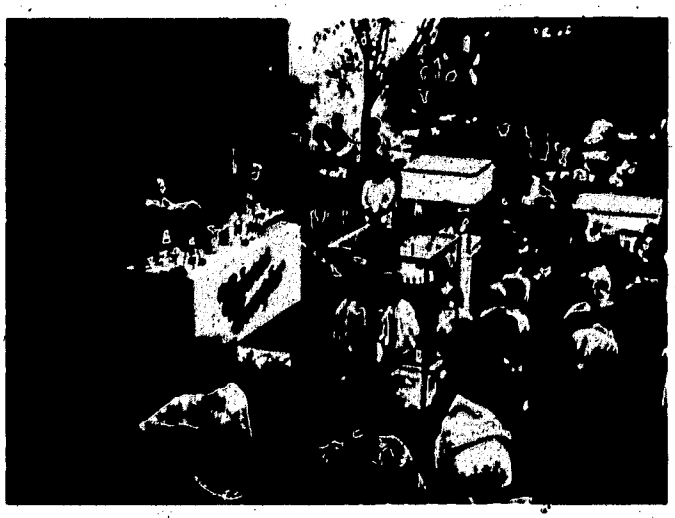
- We need pools of highly skilled scientists, engineers and technicians.
- We need managers and decision makers who understand the nature and implications of these fields.
- We need a citizenry that can follow and weigh the progress and implications of science and technology.

In addition, science is rapidly changing our perceptions and understanding of nature: in many ways science is the "humanities" of our time. Yet it is poorly understood by most citizens, and only about 20% of the public considers itself reasonably well informed.

The Need for Informal Science Education

U.S. science continues to lead the world in most areas and enjoys a status as one of the most prestigious occupations, but there is little reason to be sanguine about either the vigor of science education or the state of public awareness and understanding. Three major policy reviews point to weaknesses in our education for science and technology—and have stressed the importance of informal learning.*

- We are entering an age of technology when most careers, and even day to day activities, will directly involve working with, understanding, and living comfortably with science, mathematics, and technology.



Science in the streets. (Above) A group in Puerto Rico gathers to watch a puppet show about health and nutrition. (Below) An audience in a Philadelphia shopping mall watches science demonstrations put on by the Franklin Institute (Photo by I. George Bilyk)

- A growing number of personal, public and professional decisions require awareness and familiarity with the activities, principles and methods of science and technology.

Despite this urgency, there is an increasing gap between the relatively small technological elite and the far larger public that is both poorly equipped to understand new developments and is effectively precluded from significant participation in careers related to science, engineering and high technology.

* Science & Engineering Education for the 1980's & Beyond" National Science Foundation report to the President, October 1980. "What Are The Needs In Precollege Science, Mathematics, and Social Science Education? Views From The Field." National Science Foundation, December 1979. "Learning Environments for Innovation," Commerce Technical Advisory Board, May 1980.

Thus, to maintain a vigorous and widely representative pool of potential talent for the technological professions; to assure a base of awareness and understanding among the decision makers of industry, government, and the press; to encourage the interest and familiarity that are needed to recognize and address the personal and public decisions related to technology; and to meet the Jeffersonian ideal of an informed electorate . . . an interest and background of experience with the principles and activities of science is critical.

* * * * *

Formal education cannot fully meet this need. Schools are already heavily burdened by the need to provide "basic" education; attitudes and biases that prejudice children against the "difficult" subjects of math and science are established before they enter school; and most of our population is outside the school system, unreachable by formal education.

- Less than 50% of students take *any* science course after 10th grade.
- Only one-third of U.S. high schools require more than one year of science or mathematics.
- Sixty-four percent of the U.S. elementary school population is below the international math average. Ninety percent of those who do not take math are below the equivalent performance of other industrial countries.

This is not to say that U.S. education of scientists is poor; but the development of a technologically sophisticated population is difficult and the system is burdened with higher priorities.

Informal learning cannot solve such problems, but it can be an important supplement to the formal system and help to establish a background of experience that will facilitate and motivate participation in formal studies. And it can fill some of the gap in the understanding of adult non-scientists.

The role of the Public Understanding of Science Program has been to help provide a rich environment for such informal learning.

PUOS Strategy

We recognize that there is no single "public", but a great variety of audiences with differing needs, motivation and levels of sophistication. The PUOS program has attempted to reach these diverse audiences, by providing science materials for a wide variety of interests and levels of motivation. We have endeavored to do this in the most effective and cost-efficient manner, playing a catalytic role and avoiding areas that are well-served by the private sector.

Books, meetings, symposia and lectures tend to reach a comparatively limited, highly motivated and generally well informed elite—the "attentive public" for science. Because of this, during the past six years we have increasingly shifted focus from such activities, to

- large scale communication that can have broader impact.
- media and activities that are the most cost-effective use of our limited resources.

At the same time, we have tried to maintain a balance between different audiences, age groups, levels of sophistication and motivation.

In general most people, most of the time, get most of their information from *broadcasting*. The average American watches almost seven hours of television each day. For this reason, PUOS has focused on broadcasting as a primary means of reaching large audiences. "NOVA", for example, is now seen by as many as twenty million persons per broadcast, and its success has helped to encourage the increasing number of popular science publications and programs. Because of its large audiences, broadcasting can be particularly cost-effective.

Print journalism has comparable impact, but there are few areas where government support is either useful or appropriate, PUOS has been keenly aware of the potential abuse of journalistic independence. Because of this, almost all PUOS journalism activities have provided indirect support to the profession, rather than direct participation.

This has included briefings on current science activities, workshops, resource directories, and demonstration activities—almost always organized by or with participation of working journalists. Such participation assures that the activity is needed and not intrusive. The modest funding of this journalism support belies its intrinsic importance.

Science museums represent an especially important and often underestimated resource for informal education. For example, the cost and potential audience of a successful science exhibit are directly comparable to the costs and impact of a public television program. Almost as many persons attend science museums as all other museums combined, and it is not unusual for science exhibits to attract a total attendance of five to ten million.

These alternative media are, of course, not at all equivalent. The large audiences and "instant overview" of broadcasting cannot be equated with either the depth and retention of reading—or with the direct experience of a museum. Rather, they are complementary modes of recreational learning that serve to reinforce and supplement each other. PUOS has attempted to maintain a balanced program of activity in each of these major areas—together with a broad and balanced choice of subject matter.

* * * * *

During the past six years, PUOS has made a generally successful effort to broaden the nature as well as the size of its audience. There is a substantial difference in interest, motivation and understanding between the 20% of the public that is "attentive" to science and the much larger but less motivated and less informed balance of the public. It is easier to reach the former, and this motivated, attentive public is an important part of the decision-making process, so it is particularly important that they be well informed.

At the same time, the larger and less motivated populace is very poorly served. Popular communication media often present a seriously distorted and negative view of science and technology—at a time when our country faces serious shortages of personnel in almost every highly technical field.

Because of this, PUOS has continually explored means to work with the commercial media that reach this public. Commercial broadcast projects like "How About"* and the video news releases of the American Institute of Physics*—and journalism projects like the briefings of the Council for the Advancement of Science Writing*—have demonstrated that it is possible to merge the flair and polish of commercial media with substantial and significant science content.

Large scale communication is cost-effective—usually measured in pennies per person. But this economy of scale accompanies large projects that are financially demanding and beyond the scale of PUOS resources. To meet this challenge, PUOS has consistently encouraged cooperative funding and cooperative activities—joint funding with other corporate and government agencies, exhibit replicas and joint projects by groups of museums—and projects that strengthen the science communication capabilities of groups of organizations.

The Review Process

PUOS success in working with a mixture of mass media—broadcasting, museums, journalism, etc.—reflects extensive counsel from peers in both the scientific and communication fields.

Access to such media is very difficult, and few persons possess the skills needed to *both* explain and interpret science in popular terms and to work effectively with these institutions.

Many who are most interested in communicating about science are quite innocent of the real-world difficulties and compromises of popular communication. The goals of PUOS are at best a peripheral interest of such institutions and acceptance demands a knowledgeable and ingenious mixture of presentation and market-place skills. Without these, most projects would have little impact, and would fail either as a message-without-an-audience, or the reverse.

To guide investments in this difficult arena, PUOS has relied upon advice from a group of eminent and experienced advisors, who have provided the judgment and experience needed to shape the program and select projects that are most cost-effective and most likely to have significant impact. For the past six years, this advice has been provided through a standing review panel, chosen to provide a combination of experience and judgment in the principal media of broadcasting, museums and journalism, together with broad expertise in the principal subject areas of physical, biological and social sciences as well as ethical and public-interest questions.

Members of the ten-person Public Understanding of Science Review Panel have been chosen to maintain this overall balance, and roughly one-third has been replaced each year, assuring both new views and a continuity of experience and philosophy. This relatively slow change has provided a consistency that is critical to an effective communication strategy and has made it possible to undertake activities that require long term commitment and substantial risk.

Many PUOS proposals involve substantial questions of judgment and philosophy regarding such areas as first-amendment rights and prediction of success in the marketplace, so this sophisticated advice has been invaluable.

The PUOS Review Panel meets three times each year to discuss proposals and make recommendations to the PUOS staff. Prior to the meeting, written reviews are prepared by at least three panel members, and wherever appropriate additional mail reviews are solicited from subject or media experts.

After debating the merits of a proposal, the panelists individually rate the proposal merit as "High" "Medium" or "Low"; and these ratings together with the comments, suggestions and qualifications form the Panel's advice to PUOS.

Principal reliance is placed upon these Panel ratings, because they embrace both the comments of written reviews and a communication perspective that is well beyond the experience and judgment of any single reviewer. The process is fully documented and a summary of the discussions and ratings, together with verbatim but anonymous written reviews as well as the program's recommendation and rationale for support or denial, are all available to the proposer.

Preliminary proposals.

This review process requires roughly six months and often involves debate of priorities, audience needs, probable impact and the most cost-effective investment of PUOS limited resources. As a result, it represents a substantial investment on the part of both the proposers and the Foundation. To focus this effort as much as possible, the program requires a preliminary proposal and staff opinion of the prognosis for funding, before accepting a formal proposal.

This staff opinion has no part in the formal review process, but it provides an early indication of the program's priorities and past experiences, as well as other aspects of the proposal that may affect its prognosis for success. This opinion helps the proposer to test new ideas quickly and to decide whether they warrant further development. When the prognosis is encouraging, it helps the proposer to develop the idea and anticipate questions or changes that might affect the probability of funding.

The preliminary staff opinion is very informal and most inquiries are brief. Since the number of such preliminary ideas is quite large, the probability of success is correspondingly low—about one in twenty preliminary concepts has ultimately been supported. However, because of this initial opinion, *formal* proposals are of high quality and the funding ratio has generally averaged about fifty percent.

Many preliminary proposals are discouraged for similar

* Described below

reasons. For example, although the PUOS program has an interest in a very broad range of subjects and presentation methods, the resources are severely limited. Thus there is a constant effort to focus these resources in projects that offer the optimum impact and most "leverage"—projects that promise to interpret the most important information to the broadest and most diverse audiences through the most skilled science communicators.

Sometimes, such projects reflect ingenuity and innovation in the treatment of subject or the use of media and dissemination techniques. But *innovation* is not a value per se, and is only significant as a means to PUOS' goals. In many cases, consistency and impact by an established and experienced project or staff must be weighed against a desire to encourage and support newcomers and experimentation. The trade-offs involve difficult judgments, and the program has had many occasions to remind proposers that our goals are *excellence* and *impact* rather than training, or new opportunity, or support for institutions.

For the same reasons, the program has rejected topics and activities that we consider more central to the mission of other agencies such as energy and medicine. In cases where there has been a clear overlap of interest, we have sought to provide joint funding with the appropriate agency.

Evaluation

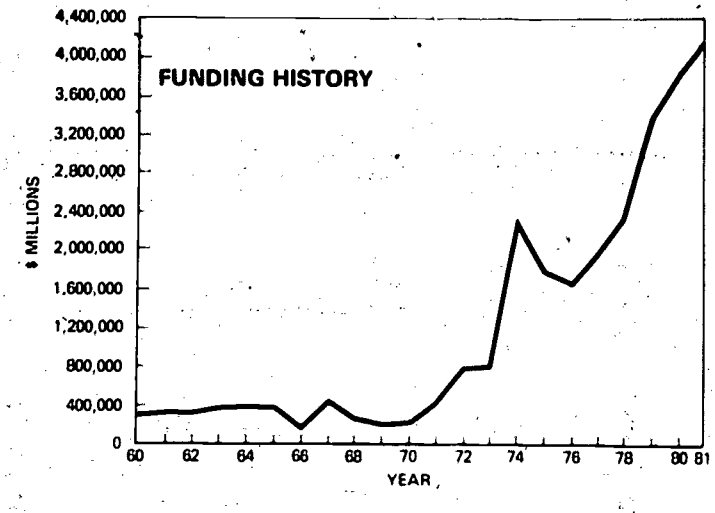
Although most people agree that we learn constantly from books, newspapers, television, radio, museums and conversations, the process is unstructured and unintentional—and is extremely difficult to define or measure. As a result, conventional evaluation techniques, designed for the structured goals and achievements and certification objectives of the classroom, are largely irrelevant and unsuitable.

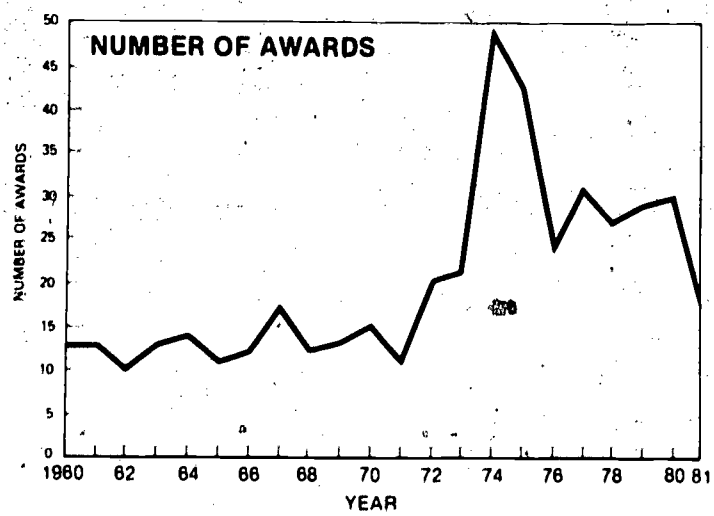
Casual and impulsive attraction to an exhibit or a television program has little in common with the structured goals and discipline of classroom and curriculum—and in the recreational arena, attracting and holding an audience is the prerequisite (though not the end) of learning. Few evaluation procedures are able to define and detect these ephemeral and individual effects, and those offered are often extremely costly.

Where evaluation activities have seemed valuable and cost-effective (as in the development of "3-2-1 Contact") PUOS staff has posed the questions: "What impact do you think this project will have?"; "What will you consider success?"; "How will you know?"; "What data can you collect to substantiate your opinions?".

Content control, advocacy, and first-amendment protection.

Since many PUOS projects involve significant matching funds, as well as communication through channels where the public has come to expect independence and reliability, the program's influence is significantly greater than is immediately apparent. And the issues of content responsibility and reliability, post difficult questions.





Whenever a government agency distributes or supports information that may relate to its own self interests, there is question of potential advocacy or at least lack of objectivity. Few question the need for more and better popular information about science, or that such information should be balanced, objective and accurate. However, many contemporary science activities are quite controversial—and one man's objectivity is another's advocacy.

PUOS has felt that, while important issues should be aired and debated at length, advocacy is not an appropriate use of public funds. To the best of our ability public funds should provide the background, information and perspective against which to weight the arguments of advocacy.

We also believe that PUOS should provide assistance and support in this goal, but that it is not appropriate for PUOS to select or further a "government position". PUOS' constant objective has been to serve as a neutral catalyst for science communication, without in any way editing or filtering content. We believe that the fact that the writers, producers, lecturers and exhibit designers supported by this program are clearly and completely independent—and that their source of support is clearly labeled—has been critically important to the success and credibility of the program.

PUOS materials are regularly found in new broadcasts, publications and exhibits that would usually reject the same material if it were not for this rigorous independence and credibility.

* * * * *

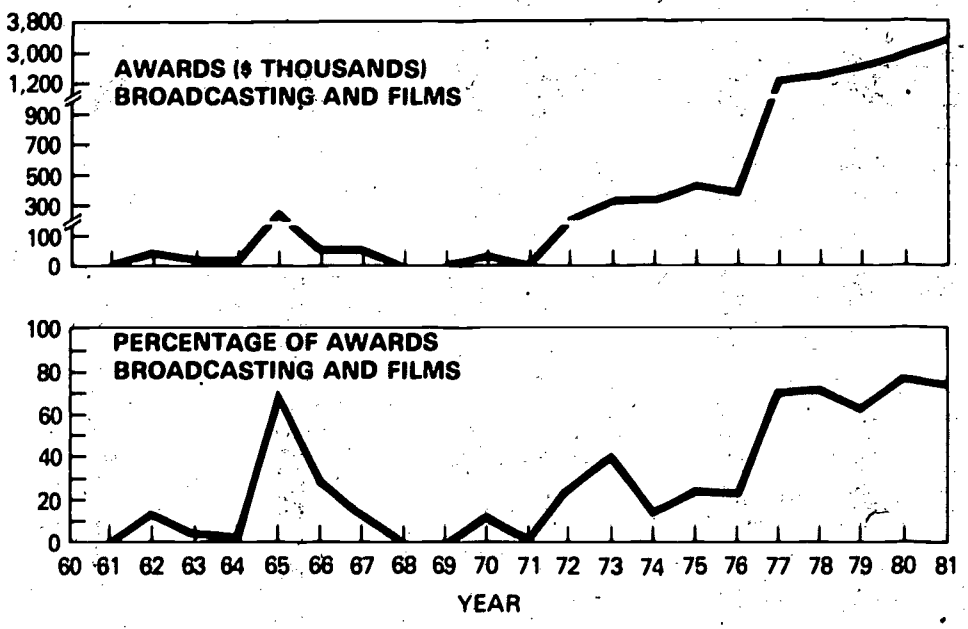
This does not mean that the program has avoided responsibility for the use of federal funds, and the balance between this responsibility and the need for project independence has always been a source of concern. We require that a proposal show persuasive 1) *intent* to present a balanced, accurate and objective discussion of its subject, and 2) *procedures* to assure this objective.

This assurance is almost always provided through the meaningful participation of advisors who are expert in the content area, and represent different viewpoints on issues of controversy. We recognize, however, that successful exhibits, programs and writing are an art that demands skill, judgment and independence—and we do *not* look for a rigorous and stifling content approval that would be likely to hamper the creativity and effectiveness of the project.

Once PUOS has been persuaded that this scientific and philosophical integrity is present, the program does not interfere or participate in the project content in any way. Although a PUOS grant is hard-won, it is accompanied by essentially complete independence, and for this reason PUOS projects have high credibility and are accepted by both media and audiences without suspicion of manipulation or "public relations". It is not unusual for PUOS projects to criticize aspects of science and technology, and many of our programs have received awards for journalistic and public interest integrity. We think that this quality and acceptance by the journalism community are direct consequences of our policy of content independence.

We also require that any co-funder observe the same practices and, like us, refrain from any interference in the project content.

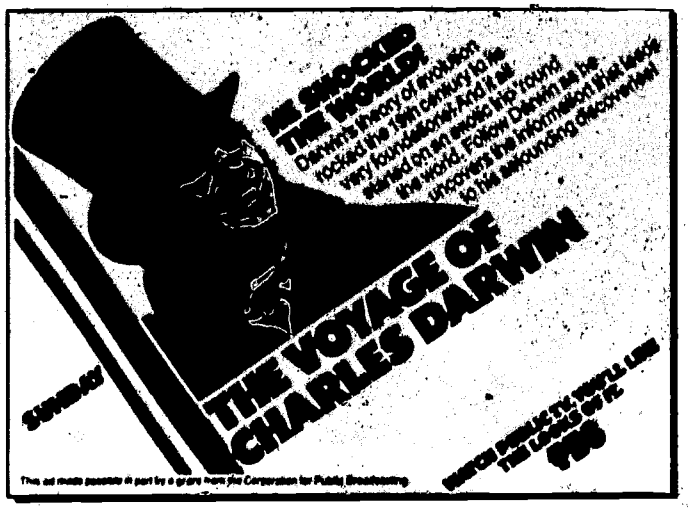
Broadcasting



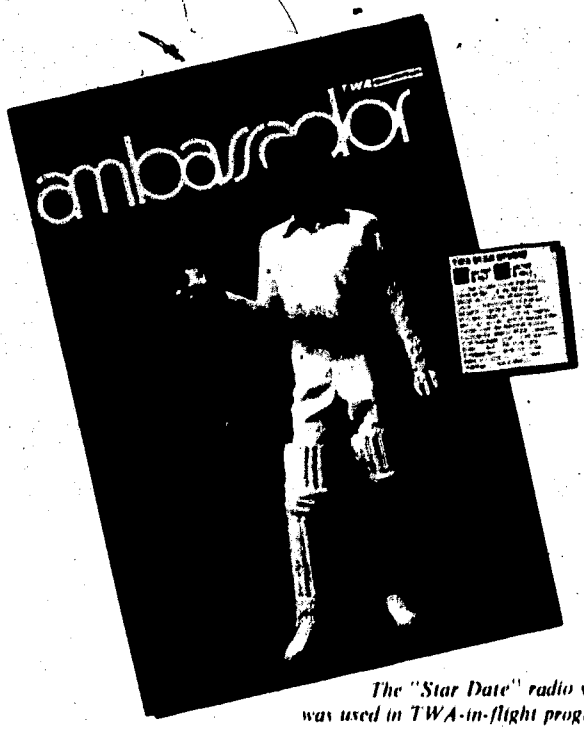
As the most pervasive communication channel, broadcasting has become the dominant activity of PUOS. The earliest large scale effort was "NOVA," which today reaches a weekly audience of five to ten million persons. Aside from this direct impact, there is little question that the program's success played an important role in demonstrating the strong popular interest in science. The response to NOVA unquestionably helped to encourage the growth of numerous science magazines, columns and television programs in recent months. PUOS provided the initial funds to plan and establish NOVA in 1972 and continued to provide a modest portion of the funds until recently.

During recent years funding for broadcasting has been increased substantially, together with a concommitant increase in impact and in the size and nature of the audience reached. Science news reports on National Public Radio are heard by over four million persons each week; "Star Date" and its companion "Astrofecha" have been aired nightly on over 1000 radio stations; and regional science television series have been started in both western and southern states.

Equally significant, the range of audience increased. "3-2-1 Contact," a daily science program for 8 to 12 year olds has been viewed by an audience of roughly 30 million, including 6 million homes without children. Over 250,000 teachers



A typical advertisement from the Public Broadcasting System campaign to increase awareness of science programs



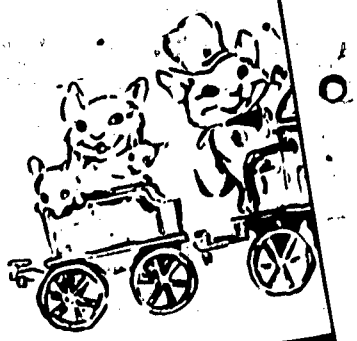
The "Star Date" radio series was used in TWA-in-flight programs

age: 7 3\4 1/27/80

name: Shaun Landau
Dear 3-2-1-Contact:
I love your show!!

I have never seen anything on Science better in my life! Please keep it going for more than 8 weeks!

from Shaun

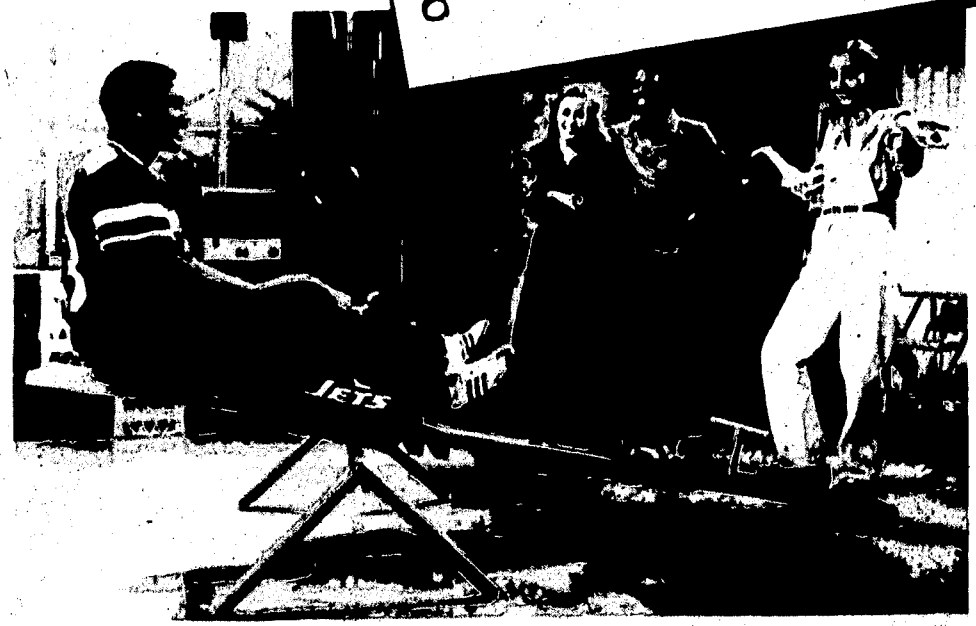


Jan. 24, 1980

3-2-1 Contact
Children's Television Workshop
1 Lincoln Plaza
New York, New York 10023

Dear Sir,
I like your show very much. But the only thing I don't like is that you should make it longer. The girls we babysat like it too.
The thing I like best is The Blood-Hound Gang.

your friend,
Molly Wright



A little leverage lets 100 pound Trini take New York Jet star Jerome Barkum for a see-saw ride in a lively demonstration of forces on "3-2-1 Contact."

THE AMERICAN COUNCIL FOR BETTER BROADCASTS

Recognizing that television programming has a significant effect on the national character of our Society; the American Council for Better Broadcasts hereby applauds and commends

National Science Foundation

for the positive contribution represented by financially supporting the broadcast of

Nova

Date *November 17, 1977*

President *Gene W Carter*

Executive Director *[illegible]*

"How About..."*

is now ready.

65 second science featurettes for family audiences now being produced with latest research on every topic from sharks to meteorites to volcanoes forty-five subjects, hosted by the Number 1 science communicator of them all — Peabody Award Winner DON HERBERT (famed as "Mr Wizard") and integrated into your own station personality.

Perfect for local news or other programming

Produced with the support of the National Science Foundation and consultation by an Advisory Board of 10 leading scientists

For sample tapes and sales information contact Marketing Syndication Director, Prism Productions, Inc. Box 83, Canoga Park, CA 91305 (210) 703-1227

*It's called "How About..." because viewers exclaim "How about that!" after seeing each incredible segment.

A MR. WIZARD STUDIO PRODUCTION

Sunday

AFTERNOON

NOVEMBER 13 1977

[illegible] (90 min.)

WEEKEND—Andy Anderson

Segments include a look at the training of an Army antiterrorist group at Fort Lewis and a look at the work of a ferry crew (60 min.)

12:30 COLLEGE FOOTBALL '77

Highlights of the weekend's top games Host Bill Flemming

AGAPE—Religion

MAINSTREAMING THE EXCEPTIONAL CHILD—Education

VANCOUVER—[illegible]

NFL FOOTBALL

NFL telecast schedules are subject to last-minute changes

1:00 DIRECTIONS

[illegible]

NFL FOOTBALL

Scheduled Cincinnati Bengals vs Vikings at Bloomington, Minn (Live)

TERRY WINTER—Religion

WASHINGTON WEEK IN REVIEW

COSMOPOLITAN KITCHEN

[illegible]

1:30 NOT FOR WOMEN ONLY

Guests for the first of five health-care discussions include Dr John Knowles, president of the Rockefeller Foundation, Dr Theodore Cooper dean of Cornell Medical College

STAR TREK—Science Fiction

An Enterprise landing party is stranded on a planet [illegible] (60 min.)

WALL STREET WEEK—Rukeyser

MOVIE—Comedy

Ride 'Em Cowboy (1942) Abbott and Costello as two [illegible] west to a dude ranch that's jumping with Indians, gamblers, romance (Dick Foran, Anne Gwynne) and

ALASKA OIL: AMERICA'S PIPE DREAM?

A look at what happens when a 7 billion dollar pipeline is pointed in the wrong direction.

Sun., Nov. 13th 3:30 • Wed., Nov. 16th 7:00

TONIGHT ON CHANNEL 13

requested the teacher's guide and the Girl Scouts established a special science program linked to the shows. Some 10,000 science badges were awarded in the District of Columbia alone! A number of science museums and schools have begun weekend programs to support and extend the enthusiasm generated by the series.

Perhaps the most difficult accomplishment of PUOS has been to provide support for commercial broadcasting and journalism activities. "How About," a weekly science report by Don Herbert (Mr. Wizard) is now incorporated in the news programs of some 140 commercial television stations. To accomplish this, the project works with a commercial syndication organization that aggressively markets the series. Funding is provided by equal grants from NSF and the General Motors Research Laboratories, and this support is identified in each broadcast. Selection and treatment are determined entirely by the project staff and advisory groups of prominent scientists and TV news editors, and the series now reaches an audience of roughly 8 million persons.

In a parallel vein, the American Institute of Physics has established periodic video news releases for commercial television.

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Most PUOS broadcasting projects have involved substantial cost-sharing by corporate and/or government underwriters. Cooperative funding of "3-2-1 Contact" with the U.S. Office of Education served to establish a pattern that has been followed successfully with a number of other agencies. In each case program officers from the two agencies agreed at an early stage that the most appropriate organization would serve as a "lead" agency in reviewing the proposal and administering any grant. This has proven both efficient and helpful to proposers, since it provides a single principal contact point, review schedule and administrative regimen. The review process has been coordinated so as to fill the policy and administrative needs of both agencies, but funds have been transferred between agencies so that the project effectively receives a single grant, from a single agency, with a single set of "ground rules".

In all cases NSF funding has been subject to assurance that co-funders accept and abide by our policies of content isolation and funding identification. Co-funding with agencies like the National Institutes of Health has been particularly appropriate when the project purpose overlaps the interests of more than one agency, and provides additional review of the need and authority of the project.

In several such cases, PUOS' media granting, review and monitoring capabilities have made it possible for such agencies to participate in projects which they otherwise could not support. Cooperative funding through transfers to PUOS has been used by the Department of Education, National Institute for Neurological and Communicative Disorders, National Institute for Mental Health, National Institute on Aging, Environmental Protection Agency, and Department of the Interior.

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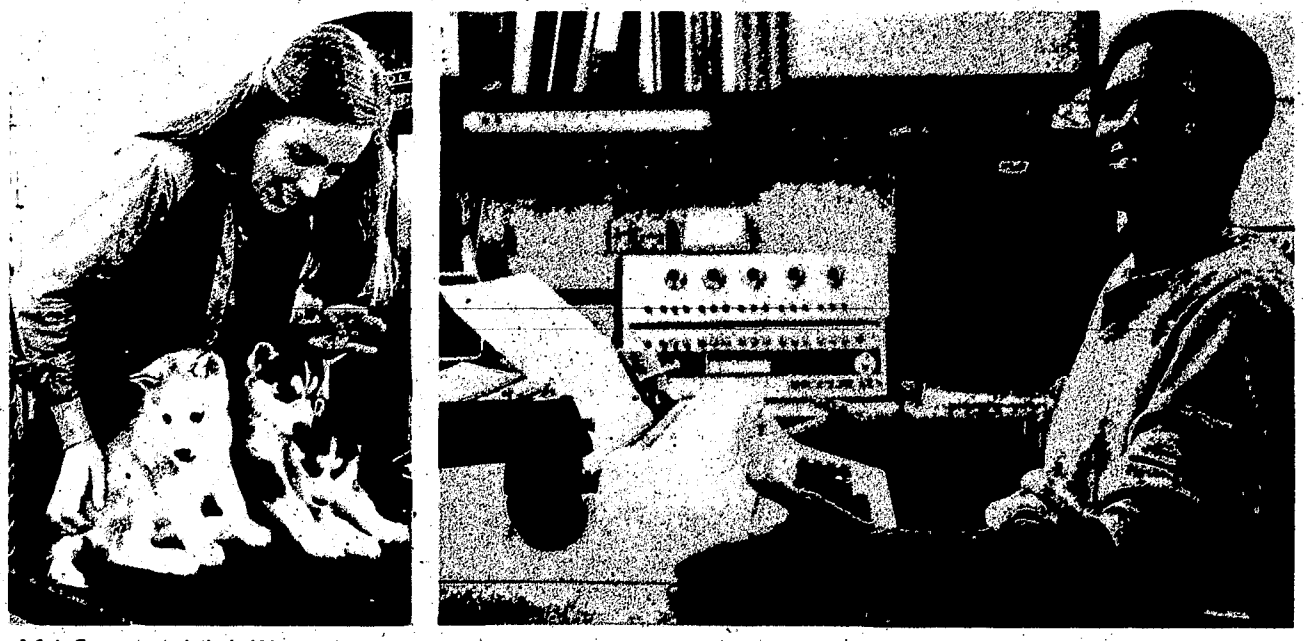
PUOS has avoided "step funding"—a process of sequential review and funding of progressive stages of activity. For example, it is not unusual for other funding sources to support public broadcast activities through a series of grants—for "planning", "treatment preparation", "script development", "pilot production", and finally a "series".

We feel that such involvement with the creative process is



3-2-1 Contact. A daily half-hour television program on Public Television to introduce children to science and technology began broadcasting in January 1980. In these two sequences, the young hosts learn about food and growth (left) and computers and speech (right). (Photos by Ken Howard)

excessive and not in the best interest of either the investor or the final product. An intimate participation in the project activity inevitably blurs the distinction between the roles of *investor* and *communicator*. The investor assumes an involvement that can easily interfere with dispassionate judgement and flexibility—and the creative process is encumbered with a very questionable intrusion. Experience has demonstrated that such intrusion can cause lengthy and costly delays for successive reviews—as well as unfortunate changes because of indecision in the review process and inept contributions to the creative process.

Instead, where the size of the grant warrants (e.g., "3:2:1 Contact") we have appointed a special panel that both reviewed the initial proposal, and provided consistent oversight at critical stages to assure satisfactory progress.

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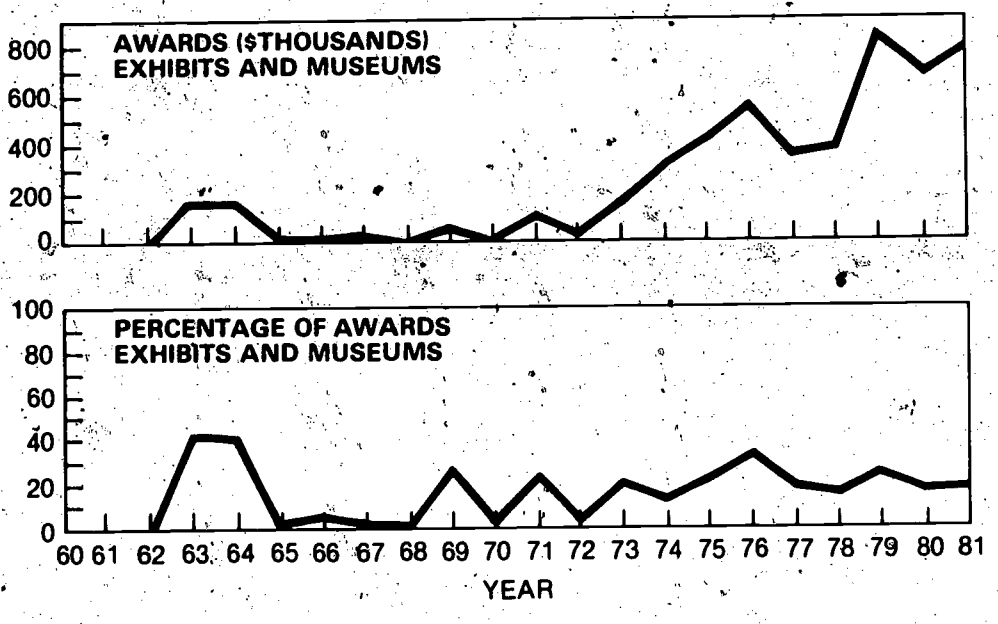
Although proposals for production of single films or programs often concern important and attractive topics, the funding and distribution aspects of such proposals usually pose difficult questions of limited impact and cost-effectiveness. Single programs are not as likely to be cost-shared as a series, where ratios of 3:1 or higher are common. Audience promotion is particularly difficult and there is no series-opportunity for continued audience development—and absence of corporate funding usually implies very limited advertising resources. Conventional film distribution does not reach audiences comparable to those of broadcasting, and scheduling of individual programs is difficult at best. Such programs are often ignored or used to fill "gutter" time, regardless of their quality.

For all of these reasons, PUOS has viewed single film projects with increasing skepticism, and has encouraged proposers to seek a role as part of an established series. In one such case, support was provided to public television station WHA for a program that was co-produced (and co-funded) by the "NOVA" series; thus providing assurances of both audience and airing pattern.

Museums



Science museums are an extremely popular, important and dedicated agent of informal science education. Attendance of science museums is over 150 million per year—almost as many as all other museums combined—*more* than baseball, football and basketball combined! Although some of this attendance represents school groups, the overall pattern is evenly divided between adults and children. Often attendance is in small groups—families or friends who visit the museum in search of new experiences and a first-hand view of the things and activities of science.

Such personal involvement is an important complement to the vicarious and casual overview of broadcasting. And while television provides an excitement and motivation that reaches large portions of the population, museums provide a direct experience and interaction that is critical to learning. Museum directors are fond of reminding that "I hear and I forget—I see and I remember—I do and I understand."

* * * * *

PUOS has significantly increased funding to science museums and has become the principal source of NSF support for exhibit development. At the same time it has established patterns that are both a cost-effective use of limited

Mount Baker on display in Seattle

Mount Baker, which had a lively past, continues to steam, and a new exhibit at the Pacific Science Center in Seattle attempts to explain exactly what is going on. The exhibit is called "Volcano Watch."

Scenic photographs are included in the exhibit, the largest being a 12-by-22-foot picture of Mount Baker itself. Sound effects, film shows and a needle tracing the earth's movement are part of the exhibit.

The needle is connected to a sensor on Mount Baker's slopes. Signals are radioed from the mountain to a receiver near Concrete, then relayed by telephone lines to the University of Washington and the Science Center.

(Herald photo by Don Anderson)

This scale model of Mount Baker comes complete with lights which show where mudflows could occur should the mountain erupt.

The display is part of an exhibit called "Volcano Watch" at the Pacific Science Center in Seattle.

A 1975 grant to explain the potential volcanic activity of Mt. Baker acquired special significance with the eruption of neighboring Mt. St. Helens.

Science museum exhibit. More than 200 species of sea life inhabit this prominently displayed living coral reef at the Smithsonian Institution's Museum of Natural History.

Eighteenth century science in Colonial Williamsburg.

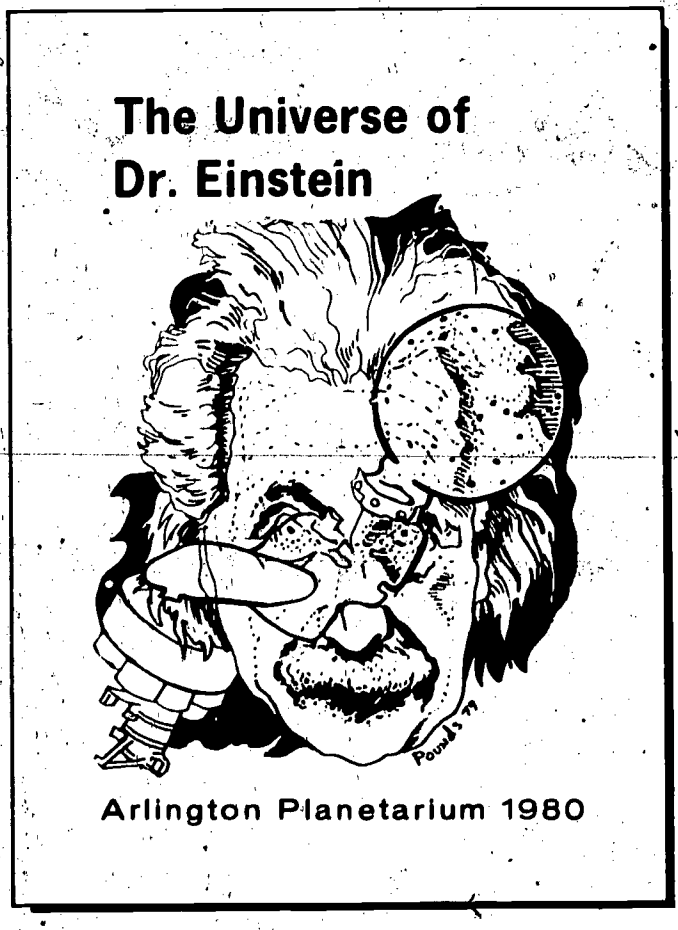
resources, and also provide as broad assistance to the field as possible. PUOS provided the initial support to establish the Association of Science and Technology Centers. This was both the first organization of science museums and also established a successful program of travelling science exhibits that reach wider audiences and smaller museums than would otherwise be possible.

* * * * *

Another means to extend the impact and cost effectiveness of museum support, which PUOS has strongly encouraged, is through cooperative exhibit development and replication of several copies for use by different institutions. For example, The Oregon Museum of Science and Industry developed a major exhibit on computers—how they work, what they do and how they are applied. As part of the project, OMSI will make a number of copies that will be installed in other museums throughout the country.

Similarly, a large and unique "Coral Reef" ecology exhibit, developed by the Smithsonian Institution, will be reproduced in several other large natural history centers. And a "hands-on" chemistry exhibit developed by the Center of Science and Industry (Columbus, Ohio) has been installed in ten other science centers.

Such replication combines support for outstanding designers and unique content skills with broad distribution.



large audiences and wide service to the field. We have concluded that generally about three replicas of an exhibit can be added, for about the cost of the original development.

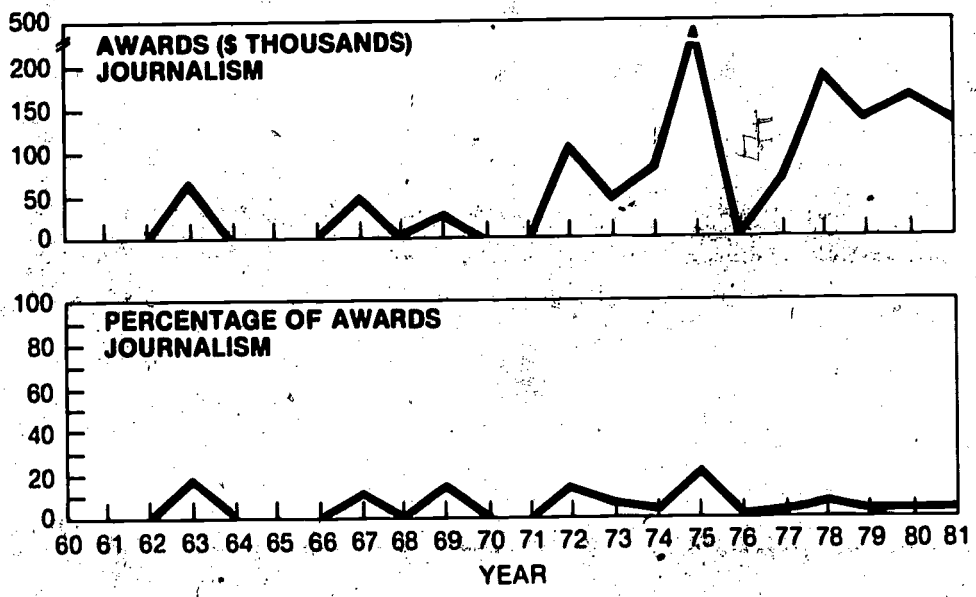
* * * * *

In 1979 a Federal task force, negotiated an agreement to resolve any question of overlapping funding by government agencies. However, PUOS felt that problems of duplicate funding are less commom than problems of interdisciplinary subjects, where a proposal overlaps the interests of more than one agency—and is thus likely to be rejected by both. To address this problem, we negotiated an interagency agreement with the Endowments for the Arts and Humanities that provides a mechanism for joint review and support of such proposals.

PUOS used many techniques to extend the impact of its support. Copies of "The Computer Compnay", developed by the Oregon Museum of Science and Industry, were made for several other science museums.

"Looking At The Light", a travelling exhibit developed by the Exploratorium and the Association of Science Technology Centers has been seen in science museums throughout the U.S.

Journalism



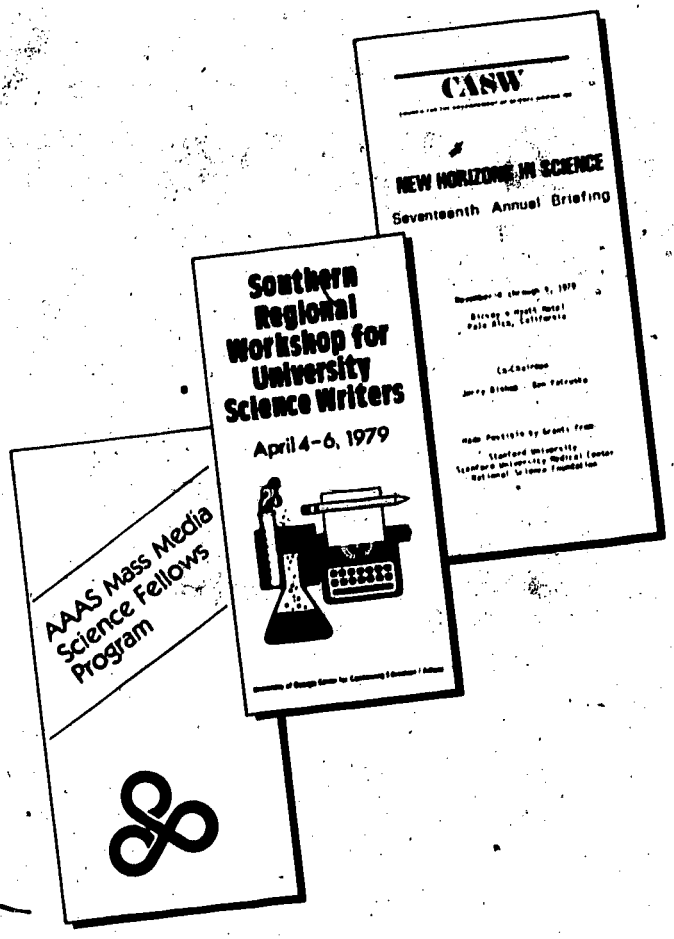
Publishing by newspapers, magazines and books is an important vehicle of popular information and understanding. However, it also represents a sector of private enterprise where the presence and role of federal support should be seriously scrutinized. PUOS has felt, for example, that authorship of books generally is (and should be) a personal statement where advocacy and personal interpretation are important and expected. In addition, there are generally healthy and appropriate market conditions for book publication in the private sector. In this environment, we do not believe that PUOS intervention is usually appropriate and we generally have not supported such proposals.

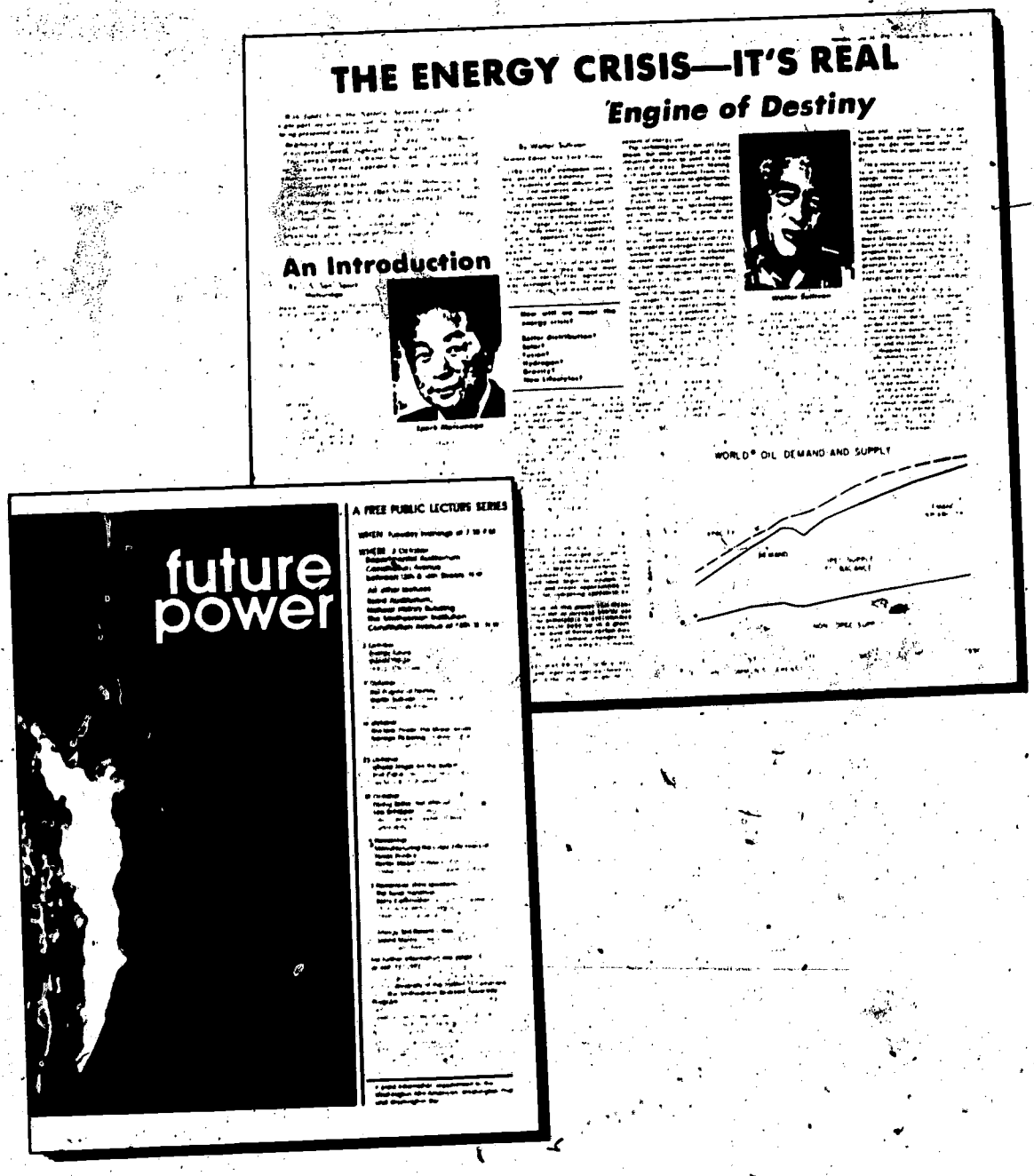
Similarly, support for journalism involves added questions of "first amendment" freedom and interference with the fourth estate. Because of these concerns, in recent years PUOS support has generally been limited to

- Support to professional groups like the Council for the Advancement of Science Writing, for self-generated activities that increase the quantity and quality of their work.
- Development of resources for professional journalists such as science resource and referral lists.
- Briefings, presentations and materials by science associations, as support for working journalists.
- Small demonstration projects to explore the potential audience for new science materials.

* * * * *

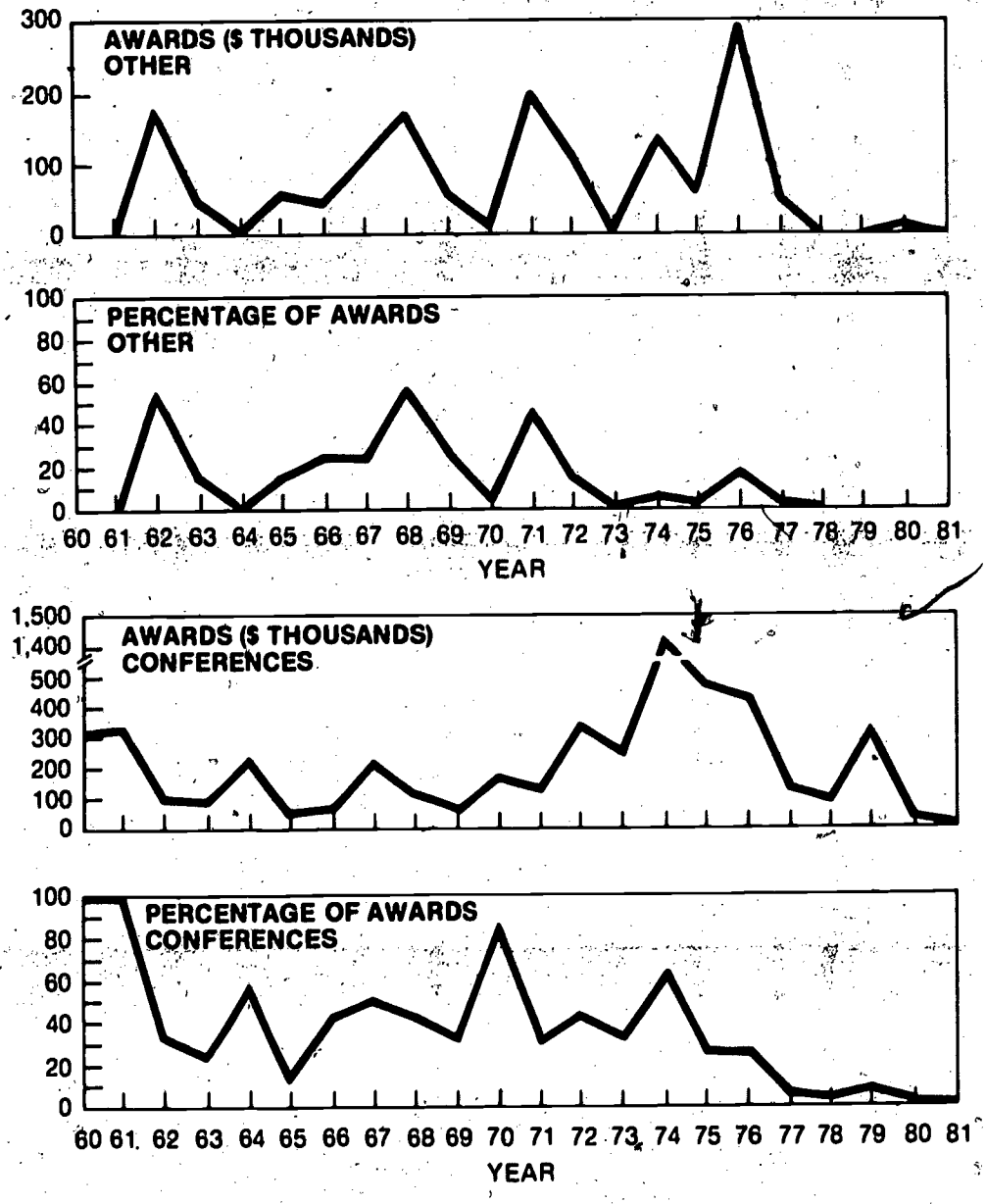
An important aspect of PUOS activities in this arena has been the continued presence and oversight of working journalists as PUOS reviewers and advisors. Their presence has helped to assure that PUOS projects include 1) mechanisms to provide balanced, objective and accurate content; 2) complete independence from any content interference; and 3) clear identification of the sources of funding.





A newspaper article and "Sunday Supplement" resulting from the Science and Human Values lecture series about energy.

Conferences and Other



In recent years, support for other activities has declined greatly, in order to focus on areas and projects that offer pragmatic means to broaden the audiences and levels of popular understanding of science. These efforts have met with substantial success and impact, while more peripheral activities have had lower priority, and were funded only when PUOS was persuaded that they would make a particular contribution to the program.

Many worthwhile activities, such as conferences on special topics or publications for special interest groups, provide information for audiences that are narrow and already well informed. Increasing the resources of a well served public has lower priority than increasing the interest and understanding of a larger and less well motivated public.

Despite the apparent value of media studies and conferences on media performance, the major problems of media roles, access and performance have been well defined; and the shortcomings of communication channels are well understood by their practitioners. We have found that conferences on the failures of media are more often cathartic than therapeutic.

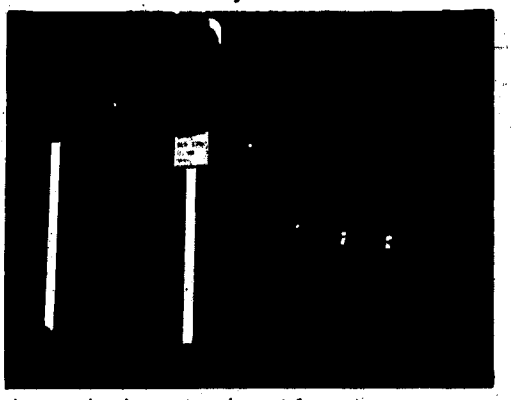
PUOS has tried to develop and maintain a balanced and integrated program. While we have tried to maintain an open environment where every proposal has a fair and equal

A rural Puerto Rican audience learns principles of nutrition from a street show.

review, effective communication requires consistency over a sustained period of time, reinforcement by a balanced array of media, and packaging by the most effective science communicators. Skill, experience and access to media and resources are indispensible.

For these reasons, PUOS has avoided replacing or duplicating successful projects unless there was a persuasive case for added impact and cost effectiveness. We have consistently regarded the role of PUOS as effective-and-large-scale informal education about science. And we have consistently rejected a role in support for any particular field or constituency.

This does not mean that we have been insensitive or disinterested in the urgent and deep-seated problems of museums and public broadcasting. But such considerations should be and have been subordinate to the primary goals of the program. The geographic distribution of museum support and the equity between large and medium sized museums is surprisingly uniform. In the same way, we have emphasized support for organizations like the Association of Science-Technology Centers and National Public Radio, that serve an entire field rather than a single area or constituent.



On a field trip in the San Juan Mountains of Colorado, a group of older citizens learns about avalanches and geological formations.

PUOS Review Panel Members

A substantial number of panel members have assisted the PUOS program during the past six years—for individual periods of one to three years. Whenever panel members have a potential conflict of interest in the proposal under consideration, they withdraw from the meeting, and they may not be the "principal investigator" of a PUOS grant while on the panel.

Dr. Anne Branscomb

Public interest communication, cable TV, technology education; Vice President, Kalba Bowen Associates; former counsel, Arnold and Porter, and Teleprompter; Board member, National Public Radio and Aspen Institute.

Dr. Dennis Chamot

Chemist; science policy; Director Professional Employees Division, AFL-CIO.

Dr. Frank Collins

Chemist, science policy; consultant and former Executive Secretary, Oil, Chemical and Atomic Workers Union; former faculty Polytechnic Institute of New York.

Dr. Kay Davis

Physics, science education, museums; Coordinator Special Projects and Supportive Instruction, Fernbank Science Center; physics, biology teacher; District President, Georgia Science Teachers Association.

Mr. Luis Garden-Acosta

Public health communication, radio; former project director, Massachusetts Foundation for Humanities and Public Policy; Field Supervisor, Neighborhood Youth Corps, Catholic Charities; Producer, Dr. Salsa's Medicine Show.

Dr. Kenneth Goldstein

Journalism, broadcasting, science writing; Associate Professor, Columbia School of Journalism; science-writer/producer, CBS, UPI, USIA; reporter-columnist for several newspapers.

Mr. Julian Goodman

Broadcasting, journalism; former President and Chairman of the Board of NBC; former News Vice President, NBC, Director, RCA and Associated Press; Peabody Award for "outstanding work in. . .First Amendment rights;" NAB Distinguished Service award with numerous awards for journalism and contributions to broadcasting.

Mr. Lee Hanna

Broadcasting, journalism; Communication consultant; former Vice President, Generaleral Manager, WMAQ-TV; Vice President and Director, Television News, NBC; Assistant Gen Manager CBS News.

Dr. William Harris

Urban studies, public interest communication; Executive Director, Public Interest Communication Inc.; Assistant Director Center for Communications, Fordham University; producer of numerous public interest television programs.

Dr. Eugene Hess

Biology; former Executive Director, Federation of Societies of Experimental Biology; Senior Scientist and Head, Molecular Biology Section, Worcester Foundation.

Mr. Lloyd Hezekiah

Museums, education, arts, urban planning; Director, Brooklyn Children's Museum; Board member, Institute for Museum Services; former Chairman creativity forum, White House Conference on Children; Council, American Association of Museums.

Dr. Norman Hilberry

Physics, science policy, education; association with Enrico Fermi in building the first nuclear chain reaction; Director of Argonne National Laboratory; Professor Nuclear Engineering, Department of Nuclear Engineering, University of Arizona.

Dr. Kenneth Hobbs

Museums, research management, film production; Director Environmental Science Center, Greenville, S.C.; former Director John Young Museum and Wings & Wheels Museum; Chief Media Development, NASA eadquarters; Board member, Association of Science-Technology Centers.

Dr. Joseph Kanner

Behavioral-research, psychology, training; Educational Advisor, Training and Doctrine Command, U.S. Army; Senior Research Scientist HumRRO; Chief, Audio-visual Research Office, Department of Defense.

Dr. Ruth Kirschstein

Biology, medicine, science policy; Director, National Institute of General Medical Sciences; consultant to World Health Organization; Primate Research Centers Advisory Committee; editorial board, Journal of Toxicology and Environmental Health.

Dr. Edward Kormondy

Biology, science education; Provost, University of Southern Maine; former Vice President Evergreen State College; Director, Commission on Undergraduate Education in the Biological Sciences, American Institute of Biological Sciences; Associate Dean and Professor of Biology, Oberlin College.

Mr. Joseph Laitin

Journalism, public communication; former Assistant Secretary of the Treasury, he has worked on the press staffs of five presidents and is considered one of the most knowledgeable journalists in government.

Dr. James Lieberman

Medicine, public communication, audiovisual production; Director, Department of Health, Greenwich, Conn.; former Assistant Surgeon General, USPHS; Director, National Medical Audiovisual Center; Vice President, Videorecord Corp.

Mr. Nathan Lofton

Education, biology; Principal of a demonstration high school in Chicago; developed and taught Peace Corps courses for teaching biology with primitive materials.

Dr. Frank Oppenheimer

Physics, museums, education; Director and developer of the Exploratorium museum, which has profoundly influenced the direction and style of contemporary science museums and exhibits.

Mr. David Perlman

Journalism; Science Editor, San Francisco Chronicle; former City Editor, Paris edition, New York Herald-Tribune; Foreign correspondent, New York Post; President, Council for the Advancement of Science Writing; Fellow, California Academy of Sciences.

Dr. Stephen Schneider

Meteorology, plasma physics; Senior Scientist, National Center for Atmospheric Research; founding editor of "Climatic Change"; author of "The Genesis Strategy" and "Climate and Global Survival."

Dr. Kenneth Starr

Archeology, anthropology; Director, the Milwaukee Museum; former President, American Association of Museums; Curator, Asiatic Archaeology, Field Museum; President Association of Museum Directors.

Ms. Catherine Tinka Streibert

Communication consultant; formerly development staff KCET; Broadcasting Program Officer, Ford Foundation; Research Director National Citizens Committee for Broadcasting; CBS News.

Dr. Tuzo Wilson

Geophysics, arctic explorer, museums, education; Director, Ontario Science Center; one of the principal developers of the plate tectonics theory and first to propose the concept of the transform fault.

Public Understanding of Science Grants 1976-1981

Since this summary includes grants which incorporate funds from other agencies, the total is substantially greater than the PUOS budgets. Where appropriate, we have noted such shared support. In each case we have listed the title, amount, and a brief description of the project, together with either the grantee or most appropriate current contact for further information.

To illustrate the major thrusts, grants are grouped by principal categories in roughly reverse chronological order. For clarity, related grants have been listed in clusters.

Data for this report were taken from program records and therefore may differ from official National Science Foundation source documents which are generated from the Management Information System data base, and may contain different inclusions/exclusions.

Summary of Grants Public Understanding of Science 1976-1981

Broadcasting

John Mansfield	FY 81	$200,000
WGBH EDUCATIONAL	FY 80	121,000
FOUNDATION	FY 79	79,000
125 Western Avenue	FY 78	200,000
Boston, MA 02134	FY 77	196,600

Partial Support for the Weekly Public Television Series, "NOVA"

In 1972 PUOS provided funds to the American Association for the Advancement of Science, to explore and plan for a public television series about science. This resulted in a proposal for, and ultimately production of the NOVA science series by WGBH. From its inception until quite recently, the National Science Foundation has continued to provide partial support for the series. Over the years the reputation of NOVA as a quality science series on public television has grown, as has its audience. NOVA attracts audiences 50 percent larger than average prime-time PBS audiences and now reaches roughly 10 million viewers weekly. Many NOVA productions have won awards, including a Special Commendation by the Documentary Jury of the Prix Futura for "The Doctors of Nigeria" and the Dupont-Columbia Journalism Award for "A Plague on Our Children."

Keith Mielke	FY 82	$1,930,000*
CHILDREN'S TELEVISION	FY 81	3,070,000*
WORKSHOP	FY 80	1,850,000*
One Lincoln Plaza	FY 79	2,680,000*
New York, NY 10023	FY 78	770,000
	FY 77	151,400

"3-2-1 Contact," A Children's Television Series About Science and Technology

PUOS has led in providing federal support for planning, development and production of the daily children's science television series, "3-2-1 Contact." The program has been aired twice daily (for early evening home viewing and in-school use) and has proven extremely popular. In the first season it reached some 23 million at home viewers and 3 million in-school viewers—including 6 million homes without children!

The series was developed with the advice, counsel and assistance of over seventy experts. . .educators, scientists, psychologists, broadcasters, parents, teachers, curriculum designers. Over a quarter million teachers' guides have been requested and the series has received the "Advancement of Learning" award from the National Education

*Co-funding from the Department of Education is included in this grant.

Association. The program has also received the Prix Jeunesse international children's TV award, four "Emmy" awards, and a special citation from Action for Children's Television.

The Girl Scouts of America has initiated a new program of science badges based on and extending the activities of the series. In addition, a number of science museums have begun weekend children's programs capitalizing on the enthusiasm generated by "3-2-1 Contact."

Foreign versions have been produced in German, French and Spanish, and translated programs are being broadcast in Venezuela, Chile, Ecuador, Costa Rica, Panama; English version is being broadcast in Philippines, Hong Kong and Armed Forces Radio/TV network.

The series has closed captions for the deaf and is available for off-air recording without charge by educational organizations. Funding has been shared by NSF, the Department of Education, the Corporation for Public Broadcasting, Children's Television Workshop, and United Technologies Corporation.

Don Herbert	FY 81	$207,864
PRISM PRODUCTIONS, INC.	FY 80	213,142
132 Stagecoach Road	FY 78	323,635
Canoga Park, CA 91307	FY 77	203,100
	FY 76	52,000

"Science Programs for Commercial Television"

The National Science Foundation and the General Motors Research Laboratories have awarded equal grants to support the development, continuing production and broadcast of "How About," a series of brief science reports that are now included in the news and feature programs of roughly 140 commercial television stations. Neither funder participates in any way in the selection or treatment of topics and broadcasters provide a verbal credit with each report to indicate the source of support.

Now in its fourth year, the series was initiated and developed with an earlier NSF grant and consists of brief reports about science activities, progress and implications. The reports are aired weekly and consist of a brief introduction by the local newscaster followed by an 80-second report by Mr. Herbert.

The series is syndicated on an exclusive basis to local commercial stations comprising over 60 percent of the total population, including 15 of the "top 20" markets. Total audience for each broadcast is estimated at over 8 million viewers. The content of the reports is determined entirely by Mr. Herbert and a group of eminent advisors who provide expertise in a variety of scientific disciplines and viewpoints.

The pattern of cooperative support by government and industry for a completely independent public information activity is an important innovation in the distribution of public service information. It extends principles of support and independence that have proven successful in public broadcasting, to the far wider audience and impact of public service commercial broadcasting. At the same time, it has demonstrated an important model for the distribution of public service information by commercial syndication.

The series received the Silver Award of the International Film and TV Festival of New York.

Richard Thomas	FY 81	$150,000*
EDUCATIONAL BROADCASTING CORPORATION	FY 80	425,000*
356 West 58th Street		
New York, NY 10019		

"A Public Television Series About Brain Research"

WNET, a New York community-owned public television station, will produce a series of eight one-hour television programs about the human brain. The series will provide an overview of current, worldwide research concerning the mind and behavior. This will include discussion of such topics as the structure and functions of the brain, including the processes of emotion, perception, thought and memory, as well as current insight into mental illness, neurological disease and drug effects.

Total budget for the series is $4.2 million. Roughly 15 percent of this will be provided by NSF together with the National Institutes of Health. The balance will be supplied by corporate and public underwriters together with major contributions from French and Japanese educational television.

Audrey Likely	FY 81	$160,426
AMERICAN INSTITUTE OF PHYSICS	FY 79	141,100
	FY 78	4,700
335 East 45th Street		
New York, NY 10017		

"Science News Features on Local TV News"

This project has demonstrated the potential utility of video news releases prepared by professional science associations for use in commercial television news programs. The project has particular significance because it continues to develop a model for media service by a major scientific association, thus combining the resources and access to authoritative scientists of such a society with the development of a visual "press-release" format and distribution system.

AIP produces and distributes to news editors in major markets, videocassettes containing five brief video reports related to a broad topic such as "The Environment." The reports are highly visual; prepared by experienced news filmmakers; and contain two sound tracks so that the news editor may either use an integral narration, or use a local narrator (with re-written narration if desired).

*Includes funds transferred from the National Institute of Neurological and Communicative Disorders, the National Institute of Mental Health, and the National Institute on Aging

AIP already has approximately 60 stations in key cities using the material and has received a strongly encouraging response from the stations.

Stations receive each series with returnable evaluation materials as well as suggested programming options. Additional distribution possibilities such as cable TV, small TV markets, and school systems are being explored.

Barbara Cohen FY 81 $199,790
NATIONAL PUBLIC RADIO FY 80 235,397*
2025 M Street, N.W.
Washington, D.C. 20036

"Science Information on Public Radio"

National Public Radio is the principal organization and network linking and providing program material to 227 public radio stations. Yet until recently there has been a very limited amount of science programming. This project has provided greatly increased science coverage in the two major public radio news series and is helping to develop the science production capabilities of the system, member stations, and independent contributing producers.

NPR has established substantial new science programming capabilities and activities through (1) addition of three staff members within NPR to produce and coordinate science materials, (2) contractual support of regular science programming at three geographically dispersed member stations, and (3) acquisition of material from other member stations and independent producers. Science segments are now incorporated several times each week in "All Things Considered," and "Morning Edition" and reach approximately 4 million persons per week. The science materials are also used to provide regular documentary and special events program, and NPR distributes a weekly 29 minute feed of "science features" to member stations for local use. The science features are also translated into Spanish for use in "Enfoque National."

Joe Neil Gwathmey FY 78 $49,679
NATIONAL PUBLIC RADIO
2025 M Street, N.W.
Washington, D.C. 20036

"Development of Science Programs for Public Radio"

This project explored science programming on public radio and tested the utility of science materials in differing lengths and formats.

The project evaluated how local stations might use, schedule and promote these materials, the preferences of station managers, and measures of audience appeal. The results of the exploration have led to NPR's current science programming patterns.

*Co-funding from Environmental Protection Agency and the Office of Water Research and Technology, U.S. Department of Interior

William V. Mayer FY 81 $169,307
BIOLOGICAL SCIENCES
CURRICULUM STUDY
P.O. Box 930
Boulder, CO 80306

"A Film for Television on Advances in Human Genetics"

Because of the rapid proliferation of knowledge in human and medical genetics and the implications of that knowledge to individuals and society, there is an increasing demand for more and better information by the public.

The Center of Education in Human and Medical Genetics, a program of the Biological Sciences Curriculum Study (BSCS), will develop, and distribute a 60-minute television program to discuss the topics of genetics, and related issues. The program will be particularly designed to meet the interests and questions of young adults in their reproductive years. Content will be organized around three general themes: the nature and study of genetic mechanisms and birth defects; personal and community health; and social and public policy. Specific topics for the programs may include genetic disorders and prenatal diagnosis, newborn genetic diagnosis, environmental agents and their genetic effects, biomedical ethics, and future directions in genetic research.

Jeffrey W. Kirsch FY 80 $259,854
SAN DIEGO STATE UNIVERSITY FY 79 5,827
San Diego, CA 92182 FY 78 200,300
FY 77 114,300
FY 76 19,175

"Synthesis:" A Public Television Series About Science Policy

This project supports a West Coast public television series about regional science-related policy issues. "Synthesis" has presented programs discussing such topics as western water policy, carcinogens in the environment, and the impact of coal burning as a major energy source. The series is produced by KPBS, San Diego, in cooperation with a number of other West Coast public television stations. To date, all programs in the series have also been broadcast by the PBS network for local use in other parts of the country.

Each program is part of an extensive effort including promotion and coordination with non-television activities such as seminars, public debates and workshops.

Harlan J. Smith FY 80 $ 52,546
UNIVERSITY OF TEXAS AT FY 79 145,715
AUSTIN FY 78 87,957
McDonald Observatory
Austin, TX 78712

"STAR DATE"

"STAR DATE" and its Spanish-language counterpart, "Astrofecha," are a series of nightly radio vignettes designed to stimulate the public's interest in and understanding of astronomy. The two-minute segments explore

topics including stargazing, astrophysics, the history of astronomy, news in astronomy and skylore. Although heard on both commercial and public radio, the production format is geared to compete with entertainment and news features on prime-time commercial radio, and the series has been aired on roughly 1000 stations, reaching approximately three to five million listeners.

"Astrofecha" has been broadcast on 70 Spanish stations. Parts of the series have also been used in the in-flight programs of Trans World Airlines—an additional one and a half million listeners. The series received a Special Interest Award from the Corporation for Public Broadcasting.

Lawrence Underwood FY 80 $47,099
UNIVERSITY OF ALASKA
Arctic Environmental Information and Data Center
707 "A" Street
Anchorage, AK 99501

"Science News Radio Spots"

The staff of the University of Alaska's Arctic Environmental Information and Data Center (AEIDC) researched, wrote, and produced a tape-recorded series of weekly science news "spots" and short programs for broadcast on public and commercial radio stations in Alaska. Subjects were chosen on the basis of timeliness, importance to the Alaska public, and how well they lent themselves to the radio format. The series received the Alaskan Press Club Award of Excellence.

William S. Singer FY 80 $100,000
PRIME TIME SCHOOL TELEVISION
120 South LaSalle Street, Suite 810
Chicago, IL 60603

"Bonding and Attachment: A One-Hour Film for Television"

Much new research has focused on the importance of early contacts between a mother and baby and the subsequent attachment of the child to the mother. Most researchers agree that the early days and months constitute a critically "sensitive period" for mother and baby and that this early relationship has special importance for the child's subsequent development.

This project brings together an experienced filmmaker with leading researchers to produce a one-hour television film to show (1) what scientists have discovered about this early bonding and attachment, (2) the importance of this relationship to the subsequent family's ability to care for the child and the child's development, and (3) practices in our society that help or hinder the process.

H. Richard Hiner FY 80 $176,388
WHA TELEVISION
821 University Avenue
Madison, WI 53706

"Science Film for TV on Acoustics of the Violin"

Much has been written about the great separation between the "two cultures" of our society. This project helped to bridge some of this gap through a NOVA television program about the overlap between acoustic research and violin quality.

The WHA documentary brings together an unusual coalition of top-ranked scientists, musicians and historians to examine violin research from Stradivari's time to our own. It dramatizes the rich relationship that can exist between science and art and also the sense of beauty that is an important, if little appreciated, ingredient in the scientific enterprise. It also reveals the violin as an inspiring example of a highly sophisticated technology entirely devoted to quality and the highest esthetic ideals.

The project is unusual in that WHA, an independent production agency proposing to produce a single program, received nominal funding and a promise of airing as part of the NOVA series. This is the first such cooperative arrangement between NOVA and a U.S. producer, and parallels the "co-production" pattern between NOVA and the British Broadcasting Corp.

PUOS feel that this is a particularly promising pattern and was pleased to be able to assist.

Martin Carr FY 80 $20,000
GREATER WASHINGTON EDUCATION TELECOMMUNICATIONS ASSOCIATION, INC.
Box 2626
Washington, D.C. 20013

"Smithsonian World, a Public Television Series About Research"

"Smithsonian World" is a projected series of seven television programs about science, produced by public television station WETA in cooperation with the staff and advisors of the Smithsonian Institution. Support from this grant is solely to WETA, and all Smithsonian activities will be contributed by the Institution.

The series will follow a "magazine" format comprising some 4 to 8 segments of different but related topics in a single program. The objective of the series is to use the resources of the Smithsonian to explore a wide range of topics related to contemporary research.

Marc U. Porat FY 79 $161,500*
ASPEN INSTITUTE FOR HUMANISTIC STUDIES FY 78 41,956
717 Fifth Avenue
New York, NY 10022

A Public Television Program on "The Information Society"

*Includes funds transferred from the White House Conference on Library and Information Science.

There is today a rapid growth of electronic technology affecting the gathering, processing and transfer of information. This new technology is already exerting profound effects on the conduct of business, research and government, and the probable future impact has been referred to as the "Information Society." The Aspen Institute and public television station WQED produced a documentary public television program describing this trend and discussing the potential impacts and issues posed by these developments. This grant represented partial support for the program and the balance was provided by corporate, private and foreign underwriters.

David Prowitt FY 79 $ 17,321
SCIENCE PROGRAM GROUP, INC. FY 77 178,800
1601 Connecticut Avenue, N.W.
Washington, D.C. 20009

"Science Scene," A 52-Week Radio Series

"Science Scene" was a weekly series ranging over the field of science and concentrating on its interaction with public policy. The format was a "modular" construction of segments, making possible programs of different lengths. Topics included such subjects as earthquake detection, swine flu innoculation program, solar energy, recombinant DNA, and results of the Viking program. A typical program included a report on a recent scientific development, the historical perspective for the development, an analysis of possible economic impact, and an evaluation of its actual or possible future effect on public policy.

The series was aired on approximately 100 commercial radio stations, largely in "public service" time.

Neil Mahrer FY 79 $200,000
PUBLIC BROADCASTING SERVICE
457 L'Enfant Plaza, S.W.
Washington, D.C. 20024

"Audience Development for Science Programs on Public Broadcasting"

This grant helped establish the audience promotion pattern of PBS. Experience with science programs like "NOVA," "Synthesis" and "National Geographic" has suggested that the audience would be increased greatly if more effort were devoted to public *awareness* of the programs, through promotion and audience development.

The project explored this potential by providing support and encouragement to local public television stations to advertise their science programs. Stations matched the NSF funds with an equal cash contribution, and funds were used only for media replacement and direct out-of-pocket expenses related to promoting the audience for science programs. Funds were allocated on the basis of market size, and this project was the science portion of substantially larger campaign to expand the audience for all types of public television programs.

The PBS audience, including science programs, grew strikingly during the period of this grant, but it is difficult to draw causal conclusions.

Arthur L. Smith FY 79 $96,577
COLONIAL WILLIAMSBURG FOUNDATION
Drawer C
Williamsburg, VA 23185

"The Itinerant Scientific Lecturer"

The 18th Century was an age when the emerging principles of "Newtonian" science were new and amazing to the public, and the lecture lends insight and appreciation for the changes and progress that have taken place since then. An earlier grant to the College of William and Mary (see p. 78) resulted in the reconstruction of an 18th Century lecture, together with the appropriate demonstrations and apparatus.

In this project, a one-hour film presents the lectures as they might have been heard in Williamsburg, the colonial capital of Virginia. The completed film will be shown to the 1.2 million tourists who visit Williamsburg annually and on public broadcasting and used in science museums, schools, and colleges.

George Arms FY 79 $205,903
SOUTHERN EDUCATIONAL COMMUNICATIONS ASSOCIATION
P.O. Box 5966
Columbia, SC 29250

"Science Focus South"

"Science Focus South" is a series of half hour public television programs discussing science-related policy issues which have particular interest to the southern region. The series and format were modeled after the successful west-coast series, "Synthesis," and the first season focussed on four programs outlining the issues and options related to energy use and resources in the Southeast.

Mary M. Randlett FY 79 $42,413
UNIVERSITY OF MISSOURI-ST. LOUIS
8001 Natural Bridge Road
St. Louis, MO 63121

"Science for Senior Adults: A Public Radio Forum"

Science for Senior Adults was a radio series offering an opportunity for older persons to receive information about issues related to science and technology. Eight hour-long programs were broadcast via a network of Missouri Public Radio stations in connection with "Creative Aging," an award winning program produced by and for older persons by KWMU-FM. The project also provided a public radio forum for telephone response

from the audience and discussions with representatives of science and industry.

James W. Cox FY 78 $181,627
TWIN CITY AREA EDUCATIONAL TV
1640 Como Avenue
St. Paul, MN 55108

"A Film on Water For World Television"

The Twin Cities Public Television (KCTA and KTCI) and the United Nations Environmental Programme produced a one-hour film about the role of water from both scientific and policy perspectives. The presentation focused on world water problems and the different ways in which communities have found solutions.

Robert McCall FY 78 $40,418
THE BOYS TOWN CENTER FOR THE STUDY OF YOUTH DEVELOPMENT
Boys Town, NE 68010

"Television News Features on Child Development and Family Life"

The Boys Town Center for the Study of Youth Development is a research center associated with Boys Town, specializing in child development, youth and family life. The Center produced twenty television news features of 1½ to 3 minutes in length on issues and research involving the fields of psychology, education, sociology and pediatrics. They were broadcast on more than twenty stations and the series was awarded a Distinguished Contribution Citation from the American Psychological Foundation.

Mary L. Grossman FY 78 $33,000
WHEELWRIGHT MUSEUM
P.O. Box 5153
Santa Fe, NM 87501

"When The Rivers Run Dry:" A Film About Water Use In The Southwest

Water allocation and its effects on resource development pose particularly difficult questions of technology and public interest in the Southwest. This project developed a half-hour film about the use of water in the Southwest, how water allocation has been viewed by different cultures and how it has been affected by changing cultures and technologies.

Bert Shapiro FY 77 $142,000
CONNECTICUT PUBLIC TELEVISION
84 Summit Street
Hartford, CT 06106

A Public Television Program: "The Expanding Universe"

This program discussed the revolutionary work of Edwin Hubble who first revealed that the universe was billions of times larger than had been expected and was growing larger with galaxies rushing away from Earth. "The Expanding Universe" was shown on the five-station Connecticut Public Television Network.

R. H. Eather FY 77 $2,800
BOSTON COLLEGE
Chestnut Hill, MA 02167

Supplementary funds for "The Van Allen Connection," a Film About the Earth's Magnetosphere

Brian A. Rosborough FY 76 $12,132
EDUCATIONAL EXPEDITIONS INTERNATIONAL
68 Leonard Street
Belmont, MA 02178

Development of Detailed Working Scripts For The Planned Television Series: "The Peopling of the New World"

This award provided planning support for a television series about anthropology.

Erik Van de Bogart FY 76 $10,400
UNIVERSITY OF MAINE, ORONO
Orono, ME 04473

"Production of An Interactive Television Program on Energy Alternatives and Policy Choices for the New England Region"

The University of Maine and the Maine Public Broadcasting Network produced a three-state live, interactive television program on energy alternatives facing the New England Region. Alternative home energy sources were identified and comparative cost-benefit factors were examined.

Museums

Sheila Grinell FY 81 $ 59,924
ASSOCIATION OF SCIENCE-TECHNOLOGY CENTERS FY 80 104,045
1016 Sixteenth Street, N.W. FY 79 125,096
Washington, D.C. 20036 FY 78 281,800
FY 77 40,000

"Supporting Activities for Science-Technology Centers"

The Association of Science-Technology Centers (ASTC) is the first organization wholly dedicated to addressing the problems of museums of science and technology. It serves as both a center for the exchange of experience and a catalyst for joint activities. ASTC was formed under an initial grant from the PUOS program in 1974, which made it possible to hire a professional staff and open an office where representatives of science centers could communicate about mutual interests such as exhibits, research, publications, administrative techniques, educational programs and community resources.

The Association has provided a focal point that brings together museums and science centers with a strong and direct interest in public science education. Its activities have grown rapidly, and ASTC is now the coordinating point for a number of major grants from private foundations and government agencies. Its activities include publications, meetings and workshops, liaison with other museums, organizations and educational institutions, professional support activities, and a traveling exhibit service which largely serves smaller museums.

Frank Oppenheimer FY 81 $329,000
THE EXPLORATORIUM
3601 Lyon Street
San Francisco, CA 94123

"A Series of Museum Exhibits on Electricity"

Electric phenomena and devices are so pervasive in nature and technology that to enable the public to better understand electricity would be a significant step toward increasing a broader understanding of science and technology in general. At the same time, the phenomena and effects are difficult to visualize, and most exhibits in this area have been uninspiring.

Over a two-year period The Exploratorium will develop and fabricate an integrated series of exhibits on electricity and electrical phenomena. Because of the subject's complexity, exhibits will involve overlapping but separate approaches to the subject. Each approach will have a number of related exhibits. Most of the exhibits will be developed for this purpose, but a few current displays will be modified to incorporate them in the overall plan.

Partial funding has been provided by NSF and additional support will be obtained from industry and nongovernmental funding. Plans for the exhibits will be published as part of The Exploratorium's "Cookbook" series, to encourage replication by other museums.

Garry Breckon FY 81 $152,127
OREGON MUSEUM OF SCIENCE AND INDUSTRY FY 78 111,000
4015 S.W. Canyon Road
Portland, Oregon 97221

"Computer Awareness Project"

The Oregon Museum of Science and Industry (OMSI) has designed and fabricated an extensive exhibit complex on computers. The exhibit includes modules illustrating the organization of a modern digital computer, the operation of its functional parts, the state-of-the-art in computer technology, and the computer's expanding sphere of influence. Modules incorporate many participatory activities, displays, and graphics. Interactive computer terminals permit the public to explore the use of computers in such fields as transportation, education and research. An illustrated guide book has been developed to provide additional information for those who wish to explore the subject in greater depth.

The project has proceeded in two phases: Phase I for design and installation of the exhibit at OMSI and preparation of the guide booklets and evaluation instruments, and Phase II for evaluation of the exhibit in use at OMSI—followed by production of two replicas that are installed in other science centers.

Robert West FY 82 $ 88,000
MILWAUKEE PUBLIC MUSEUM FY 81 146,375
800 West Wells Street FY 80 140,113
Milwaukee, WI 53233

"Museum Exhibit on the Earth's Structure and History"

The Milwaukee Public Museum will construct a 9,000 square-foot earth science exhibit hall entitled, "Continents, Oceans and Life in Motion—a New View of the Third Planet." This exhibit will be built around the concept of plate tectonics, the new paradigm of the earth sciences.

The hall, starting with a film detailing the plate tectonics concept, will emphasize the continuous interaction of the physical world with the complex life which has evolved on its surface. Exhibits will catalog the physical earth, the processes which have constructed our planet, and the visible products which affect all life. Other displays will document the course of organic evolution, highlighting several major events, and pointing out the continuous interaction with the physical world.

This new exhibit hall, built largely by present museum personnel, will be, by virtue of its dynamic displays, an educational model for other museum educators and schools throughout the Midwest. Its general appeal will draw the public into the museum and enhance the educational capabilities of the institution. Allied outreach programs, including books, filmstrips, textbook illustrations, and teacher training programs will further extend the new exhibit into the community. Substantial amounts of matching funds have been contributed by the local community.

David A. Ucko FY 81 $190,371
MUSEUM OF SCIENCE AND INDUSTRY
57th Street and Lake Shore Drive
Chicago, IL 60637

"Demystifying Science"

This project is designed to increase public understanding of the nature of science and the scientific process through an interactive museum exhibit.

The exhibit will consist of four major sections, 1) the nature of science and the essential features of the scientific process, 2) the practice of science—the "scientific method" in theory and in reality, 3) examples of the scientific process—case studies of actual developments in science and technology, and examples of scientists—an introduction to a broad range of "everyday" scientists.

At least two million visitors are expected to view this exhibit within a five-year period. In addition written information will be disseminated to the general public, school groups and teachers, museum professionals, and researchers.

Charles Davis FY 81 $70,043
IMPRESSION 5
1400 Keystone Avenue
Lansing, MI 48910

"Playground Physics"—A Museum Exhibit

Impression 5 Museum will design, and build an interactive museum exhibit entitled "Playground Physics." This computer-facilitated exhibit will encourage children and adults to participate in the scientific process of hypothesis, experimentation, and observation by interacting with the physics and behavior of objects which are common to a child's environment. The display will provide a basis for understanding simple concepts of physics, provide experience with and exposure to computers and will introduce teachers and parents to the use of computer-facilitated learning exercises. Following production of a tested prototype, a duplicate version of the exhibit will be tested at four other museum sites. A fully tested copy will then be distributed nationwide through ASTC's Traveling Exhibit Service. A final report and manual will be written for distribution to museums and schools. Duplicates of the exhibit will be available for purchase by other museums for an estimated $10,000.

Walter H. Adey FY 82 $168,357
SMITHSONIAN INSTITUTION FY 80 146,794
Washington, D.C. 20560 FY 78 118,174

"A Living Coral Reef As A Tool For Public Education in Ecology"

Ecological balance is an important aspect of contemporary natural science and its principles are critical to many science-related public issues. However, the complexity of ecosystems makes them very difficult to comprehend, and the scale is usually too large to replicate in a museum environment. A unique exception to this difficulty is an elaborate living coral reef ecosystem which marine biologists of the Smithsonian Institution established in the museum's laboratory.

This project transferred the model to a larger tank on the main floor of the National Museum of Natural History where it is designed as a working research facility on view to the public, together with films, captions, recordings and a technical publication describing the ecology and research. Estimated audience for this exhibit will be five million visitors each year.

The exhibit is being duplicated and installed in several other major museums where it will reach an equally large audience. By providing such replicas and an appropriate training program, the Smithsonian's subject and exhibit expertise will be shared with other museums and a much larger audience.

Sheila Grinell FY 80 $107,789
ASSOCIATION OF SCIENCE-TECHNOLOGY CENTERS
1016 Sixteenth Street, N.W.
Washington, D.C. 20036

"A Traveling Science Museum Exhibit on Light and its Properties"

This project provides a traveling exhibit on light and images for circulation among science centers. The exhibit, based upon a series of displays which were developed by The Exploratorium museum, is accompanied by supplementary descriptive materials and demonstrates a variety of phenomena associated with mirrors, lenses, shadows and color.

The traveling exhibit has been developed and circulated by the staff of the Association for Science-Technology Centers and is expected to be seen by roughly 1 million visitors in about 15 centers. The exhibit helps to draw audiences to the member museums, provides an exceptionally intriquing display, illustrates some of The Exploratorium's presentation technique, and extends the impact of earlier NSF investments to smaller museums.

Daniel L. Goldwater FY 79 $119,000
THE FRANKLIN INSTITUTE MUSEUM AND PLANETARIUM
20th Street & The Parkway
Philadelphia, PA 19103

"Museum-On-The-Mall"

This project is exploring the potential of science museums to serve the 35 million daily visitors to large urban shopping malls. The demographics of this audience indicate that it is substantially different from the typical museum attendance and includes a significant portion of teenagers. As such, shopping malls offer an opportunity to both extend the museum's impact and also attract a new audience to the museum itself.

Museum-On-The-Mall is a mini-museum in a large inner-city urban shopping mall. Through a wide variety of exhibits, workshops, science information resources and lecture/demonstrations, the project is testing the potential to reach wider audiences and to attract new audiences. Preliminary experiments have been encouraging and have shown an audience that is signficantly different from that of the parent museum.

Sheila Grinell FY 79 $3,329
ASSOCIATION OF SCIENCE-TECHNOLOGY CENTERS
1016 Sixteenth Street, N.W.
Washington, D.C. 20036

"Preliminary Review of Audience Study in Science Museums"

This project collected information on museum audience studies.

Sheila Grinell FY 79 $28,085
ASSOCIATION OF SCIENCE-TECHNOLOGY CENTERS
1016 Sixteenth Street, N.W.
Washington, D.C. 20036

"A Conference on the Use of Drama in Science Museums"

Extending an ASTC exploration of dramatic presentations as a form of travelling exhibit, this conference collected experience on the use of theater in science museums. A report summarizing the conference is available from ASTC.

FY 78 $33,986

"Extension of ASTC Traveling Exhibit Services"

This grant provided support to ASTC to formulate policies for the Traveling Exhibit Program and circulation of "Glass," a dramatic performance about the history of glass and its impact on science and society. "Glass" was performed at ten museums around the country.

Robert Semper FY 79 $366,409*
THE EXPLORATORIUM
3601 Lyon Street
San Francisco, CA 94123

"Exhibit Development Including a Linguistic Display Area"

The Exploratorium has acquired international renown as among the most innovative of U.S. science museums. It presents an unusual combination of art and science that appeals to an exceptionally diverse audience. Through this grant, The Exploratorium extended its exhibit area to include a new section focusing on research related to linguistics.

The section included such aspects of language as the physics of sound production, the biological and evolutionary aspects of language, the psychology of the perception of meaning the expression of meaning through language. The project involved the development of about thirty-five exhibit pieces and a variety of written material including appropriate take-home material.

Plans for and experience with the exhibits were documented for use by other museums and the exhibit will be seen by several million persons during its lifetime.

Mark Littman FY 79 $50,643
THE HANSEN PLANETARIUM
15 South State Street
Salt Lake City, Utah 87111

"Planetarium Star Program on Relativity and Astronomy"

For the 1979 centennial of Einstein's birth, the Hansen Planetarium developed a commemorative program discussing his life and contributions to astronomy. This program, a 45-minute package of slides, audiotapes and script was duplicated and shown by over 550 planetariums throughout the country to an estimated audience of over two million persons.

Dennis Schatz FY 79 $141,542
PACIFIC SCIENCE CENTER
200 Second Avenue North
Seattle, WA 98109

"Environmental Monitoring Center"

The changing quality of our environment is monitored by many means, yet these techniques are generally not visible to the public. The Pacific Science Center has developed a working environmental center where data are collected, displayed, and interpreted for the public in real-time. Led by PSC staff, the center is incorporating actual research efforts by the faculty and students of the University of Washington. The NSF contribution supplements substantial primary funding by PSC and local sources.

Robert Hinds FY 78 $101,620
MARINE SCIENCE CONSORTIUM
P.O Box 16
Wallops Island, VA 23337

"An Exhibit for Public Education in the Ecology of the Offshore Wetlands"

The range of an ecosystem over both distance and time makes it generally difficult to demonstrate the nature of ecological balance and the interdependence of issues related to energy and environment. However, the offshore barrier-island ecosystem provides an excellent example of these relationships, concentrating a great variety of familiar animals, plants and maritime-earth characteristics in an appealing, accessible environment.

This project supported the preparation of displays and materials for an interpretive center dealing with the ecology of the salt marsh barriers island system at Wallops Island, Virginia, by the Marine Science Consortium, a marine teaching and science facility supported by 16 member colleges and universities.

Although designed primarily for the 1.25 million visitors to the Assateague-Chincoteague area annually, the center also serves local schools and communication media. After initial funding, the Center will be supported by operating funds from the Consortium.

Sherman Kent FY 78 $22,901
OKLAHOMA SCIENCE AND ARTS FOUNDATION
2100 N.E. 52nd
Oklahoma City, OK 73111

"An Interactive Weather Exhibit at OMNIPLEX"

Since portions of Oklahoma experience the highest

*Co-funding of $183,000 from the DISE program of NSF is included in this grant

average number of windstorms, hailstorms and tornadoes of any place in the United States, interest in weather is particularly high. The OMNIPLEX museum includes an exhibit which presents all of the weather instrumentation of a working forecasting station. This project enlarged the exhibit by adding a tornado simulator which shows the preconditions and formation of tornadoes as well as two interactive components showing how meteorologists analyze weather phenomena. Representative forecasting activities were dramatized and meteorology students were trained as explainers to assist visitors to the exhibit.

Roger Duff FY 78 $15,000
CANTERBURY MUSEUM
Christchurch, New Zealand

"Exhibit Development at the Canterbury Museum Antarctic Center"

Christchurch, New Zealand has been the starting point for most antarctic exploration and research. The Canterbury Museum commemorates these activities and is visited by almost a half million visitors each year. This project continued development of displays illustrating the concepts of continental drift and auroral behavior. It also supplemented the museum's collection of antarctic films and their uses in the museum's educational program.

Daniel Goldwater FY 77 $11,200
FRANKLIN INSTITUTE
Philadelphia, PA 19103

"Museum Exhibit Development"

In the spring of 1976 the Franklin Institute opened a special exhibition and demonstration program subtitled *Futures*. The exhibition and its demonstration programs encouraged visitors to explore technical choices relating to energy in the context of present and alternative American life styles and values. The exhibit was developed and operated with support from NSF, NEH, NEA, the First Pennsylvania Corporation, Hewlett-Packard Company, the Pew Memorial Trust, and other agencies, corporations and foundations. This grant provided added presentation capability for the demonstration and lecture areas, and supplementary projection and computer simulation equipment.

Charles O'Connor FY 77 $19,500
CENTER OF SCIENCE AND INDUSTRY FY 76 23,700
280 East Broad Street
Columbus, OH 43215

"Chemistry for Museums"

The Center of Science and Industry developed an innovative "hands on" chemistry exhibit where the museum audience can perform simple experiments. At a meeting of the Association of Science-Technology Centers, a number of attendees indicated that they would like to have a replica for their own museums.

This grant provided funds to develop the exhibit and to provide ten duplicate exhibits for other museums.

Watson M. Laetsch FY 76 $10,000
UNIVERSITY OF CALIFORNIA, BERKELEY
Lawrence Hall of Science
Berkeley, CA 94720

"New Participatory Exhibits in Astronomy: An Experimental Approach to Astronomy Education for the General Public"

The Lawrence Hall of Science developed plans for an innovative astronomy education program for use in Lawrence Hall and in other science museums and centers across the country. Relying heavily on research on new visitor participation techniques, the astronomy program included special "hands-on" apparatus including small telescopes of various types, a panoramic simulation of the night sky, and special discussion sessions on new advances in astronomy for museum visitors.

This award provided additional funding to cover increased construction and evaluation costs.

Lee W. Simon FY 76 $25,000
ADLER PLANETARIUM
1300 S. Lake Shore Drive
Chicago, IL 60605

"Astronomy in America"—A Bicentennial Exhibit on Astronomy in the United States

The Adler Planetarium developed an exhibit, "Astronomy in America," dealing with two hundred years of progress in the study of astronomy in the United States. Five selected themes were emphasized in separate island displays, each of which related back to a central panorama on which graphic techniques were used to display the highlights of two hundred years of astronomy.

Journalism

J. Thomas Ratchford FY 81 $146,786
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE FY 80 57,354
1776 Massachusetts Ave., N.W. FY 79 55,360
Washington, D.C. 20036 FY 78 73,244
FY 77 63,600

"Mass Media Science Fellows Program"

Competent scientists and engineers who are also trained in the ways of the media can make a unique contribution to the public understanding of science. Yet few scientists have an opportunity to learn about the practices and problems of working journalists—and most publishers or broadcasters have little opportunity to explore the potential value of highly trained science reporters.

The AAAS Mass Media Science Fellows Program provides the opportunity for up to 20 advanced students in

the natural and social sciences to spend 10 weeks during the summer working as reporters, researchers, or production assistants with mass media organizations. The program aims to: (1) strengthen the relationship between scientists and engineers and the media, (2) provide young scientists and engineers at a critical stage in their careers the opportunity to observe and participate in the process by which events and ideas become news, (3) improve the fellows' communications skills in describing complex technical subjects to that they are comprehensible to lay people, and (4) increase the fellows' understanding of editorial decision-making and the manner in which news information is effectively disseminated.

To date, over 100 fellows have been placed with 17 newspapers, 2 weekly news magazines, 9 radio stations, and 18 television stations around the country. Among these sites have been CBS ("Universe"), *The Washington Star*, WCCO-TV, *The Rhode Island Journal*, KUNC-FM, and *The San Francisco Chronicle*. Roughly 40% of the fellows have continued professional involvement with print and broadcast journalism; and a substantial number have been hired by the organizations where they served—including reporters and editors for the *Los Angeles Times*, California Public Radio, *Newsweek*, and *Chemical and Engineering News*.

Additional funds for this project have been provided by private and corporate foundations, and AAAS.

William J. Cromie FY 81 $27,011
COUNCIL FOR THE ADVANCEMENT OF SCIENCE WRITING FY 78 41,594
168 North Elmwood
Oak Park, IL 60302

"New Horizons in Science: Briefings for Science Journalists"

This project provided support for the annual briefings for journalists, "New Horizons In Science." At these meetings science journalists and researchers discuss new scientific discoveries which are likely to have an impact on society and which have not generally been reported to the press. Some 15 to 18 scientists discuss new developments in their fields and respond to questions from the journalists.

The meetings are designed by and for working journalists to provide maximum formal and informal contact between scientists and journalists as a way to improve communication between scientists and non-scientists, to increase the knowledge of professional science journalists, and to increase the quality and amount of science reporting in the popular media. The meetings have proven very successful and invariably result in extensive coverage of new information in the print and electronic media.

T. Neil Davis FY 80 $57,101
UNIVERSITY OF ALASKA
Fairbanks, AK 99701

"Alaska Science Forum"

This grant supported the preparation of a weekly series of short articles on scientific topics relevant to life in Alaska and nearby high latitude regions of North America. The articles were included in some 14 newspapers.

Whitman Bassow FY 80 $90,981
CENTER FOR INTERNATIONAL ENVIRONMENT INFORMATION OF THE UNITED NATIONS ASSOCIATION OF THE USA
300 East 42nd Street
New York, NY 10017

"A Program to Improve the Quality of Media Coverage of Energy/Environment Issues"

Working reporters are frequently faced with fast-breaking news stories about highly specialized areas of science and technology. Energy alternatives and toxic chemicals are two such areas, where new developments are frequent and authoritative specialists are often difficult to identify.

To assist the news media in providing accurate, balanced and informed reporting on such developments the Center has initiated two "authority" Guides that lead to authoritative sources of scientific and technical information and commentary. The first is a *Guide to Specialists on Toxic Substances;* the second, is an updated and expanded version of the 1979 *Guide to Energy Specialists*. The Toxics Guide lists over 1,000 experts on a broad range of energy technologies and conservation issues. The specialists for both Guides are drawn from industry, government, the scientific community and environmental organizations.

These Guides are unique in that everyone listed in both knowledgeable and will, as a public service, respond to telephone inquiries from reporters and editors. The project aims (1) to improve the quality of media reporting on energy/environmental issues and (2) because of better reporting, to increase public understanding of the critical decisions that our country must make to deal with these issues. Single copies of the Guides are distributed free to over 2,000 dailies and radio and TV newsrooms, and will be updated periodically. Additional copies are purchased and the series is expected to become self-supporting.

Joseph Duffy FY 80 $50,272
NATIONAL ENDOWNMENT* FOR THE HUMANITIES
Washington, D.C. 20506

Courses by Newspaper—"Energy and the Way We Live"

Since 1973, Courses by Newspaper (CbN) has pre-

* Primary support for CbN is provided by the National Endowment for the Humanities (NEH). NSF funds transferred to NEH by this grant provided partial funding for production and distribution costs of "Energy and the Way We Live" which was offered in the spring of 1980.

pared educational programs on topics of significant interest to a broad segment of the adult population.

Each CbN program features a series of 15 weekly articles that appears in more than 450 newspapers nationwide. Written by scholars selected for their expertise and ability to communicate with a general audience, the articles are read by approximately 5 million persons weekly. These articles are also the basis for local forums and discussion groups offered by colleges, libraries, and community organizations.

For persons interested in pursuing these topics beyond the newspaper series, CbN produces a reader, a study guide, and audio tapes. Formal courses based on these materials are offered for credit by more than 300 colleges and universities. Some 5,000 students, mostly adults, enroll in each program.

Virginia L. Carter FY 80 $22,905
COUNCIL FOR ADVANCEMENT AND SUPPORT OF EDUCATION (CASE)
Suites 530 600
One Dupont Circle
Washington, D.C. 20036

"Conference on Communicating University Research to the Public"

University newswriters and public information staffs often have to communicate university research to the public, but also often lack a background that will prepare them for the interpretation of science via mass media. To assist with this problem, the Council for Advancement and Support of Education developed, sponsored, and evaluated a prototype national conference on Communicating University Research to the public. The project also distributed a "how-to" handbook on covering science; added a strong science emphasis to CASE's future national and district professional training programs; and conducted a national recognition program for outstanding work by university science writers and editors.

Sharon M. Friedman FY 79 $27,404
LEHIGH UNIVERSITY
Bethlehem, PA 18015

"Workshop on Science Communication for Reporters"

In most local newspapers science articles are usually taken from the wire services or national syndicates. There is little local coverage of science because reporters lack training in this area.

This grant provided a demonstration workshop to train general-assignment newspaper reporters to write about science and technology. The workshop lasted three and one-half days and included presentations by professional science writers, a day of specialized training and practice, a half day with local scientists and engineers discussing local science issues, and a half day with reporters, editors and a panel of scientists discussing problems related to science reporting.

Ronald E. McMillen FY 78 $37,600
AMERICAN PSYCHIATRIC ASSOCIATION
1700 18th St., N.W.
Washington, D.C. 20009

"Symposium for Media Writers: Research Briefings on Mental Health"

The American Psychiatric Association conducted a two-day symposium for national media writers, at which prominent research scientists in the mental health field presented current findings and advances in knowledge for treating the mentally ill and understanding human behavior. The symposium was followed by a series of regional half-day briefings for local press. The symposium resulted in extensive coverage in the media, including cover stories in two national news magazines.

Gloria Walker FY 79 $76,975
CLARK COLLEGE FY 78 65,200
Mass Communication Program
Atlanta, GA 30314

"An Experimental Science Column for Minority Newspapers"

This explored and tested the acceptance and utility of science materials specially prepared for small black newspapers. During the two-year test, articles were prepared and offered to some 200 black newspapers. Twenty percent of these used the materials and the editors' response showed continuing interest, especially a desire for more materials featuring black scientists and their work.

Robert C. Anderson FY 78 $8,100
Boyd Graduate Studies Research Center
THE UNIVERSITY OF GEORGIA
Athens, GA 30602

"Workshop for University Science Writers"

The University of Georgia held a two and a half day workshop for some 100 public information officers on the staffs of universities in a fourteen state area served by the Southern Regional Education Board. The purpose of the workshop was to improve the science communication skills of public information officers who are often assigned to science topics but who typically are journalists with little background in science reporting.

Heather David FY 78 $9,600
AMERICAN ENTERPRISE INSTITUTE
1150 Seventeenth Street, N.W.
Washington, D.C. 20036

"A Science Issue Communications Planning Workshop"

This project assembled a group of publishers, editors,

reporters and scientists to examine the potential for a science background information service for journalists.

Marc Ross FY 77 $14,837
UNIVERSITY OF MICHIGAN
Ann Arbor, MI 48109

Science Briefing on "Conservation, Technology and Energy Policy: A Conference Model to Provide Information to Reporters and Policy Makers"

This project explored the interest of journalists in a university seminar on energy alternatives.

David A. Lind FY 76 $6,300
UNIVERSITY OF COLORADO
Boulder, CO 80302

"Series of Public Lectures in the Sciences and Associated Science Journalism Program"

The Department of Physics and Astrophysics and the School of Journalism at the University of Colorado, Boulder cooperated in the presentation of a series of seminars on the sciences for the university and general public in the Boulder area. In addition to the public lectures, a special series of seminars was held by the School of Journalism, and feature stories on the public lectures were prepared by the students and distributed to newspapers in the Rocky Mountain region.

Edward S. Cornish FY 76 $10,000
WORLD FUTURE SOCIETY
4916 St. Elmo Avenue
Washington, D.C. 20014

"Resources Directory for America's Third Century: A Bicentennial Planning Study"

This project included a taxonomy and other reference materials related to futures research.

Other

Luis Lugardo FY 80 $ 7,970
COMMITTEE OF WORKERS FOR THE PROTECTION OF CONSUMERS FY 79 79,776
P.O. Box 11542
San Juan, Puerto Rico 00922

"Communicating Scientific Principles of Nutrition in Rural Puerto Rico"

The Committee of Workers, a non-profit educational organization sponsored by the International Ladies Garment Workers Union of Puerto Rico, conducted a series of rural puppet shows and television programs to help improve understanding of the scientific principles of nutrition. Music, humor, dance and audiovisual media were incorporated in the traveling programs, and performances were scheduled in markets and villages, as well as community and work plant meetings and other public places. A total rural audience of 15,000 is estimated for the travelling programs, plus several hundred thousand through television broadcasts.

Jack Golodner FY 80 $ 2,300
LABOR INSTITUTE FOR HUMAN ENRICHMENT FY 79 59,110
815 16th Street, N.W.
Washington, D.C. 20006

"Information Transfer Through Theater"

Occupational health hazards and the scientific background of topics like toxic chemicals are important contemporary concerns, but are often poorly understood by those directly affected. This proposal sought to reach blue collar workers and to present to them the kind of technical information they need to increase their awareness of, and understanding of, occupational health problems.

The project explored the use of a format using a dramatic presentation on occupational health to stimulate a discussion of toxic chemicals between the audience and technical experts.

In order to assure balance and objectivity, the discussion leaders and advisory committee included representatives of both industry and labor as well as academic experts on occupational health.

Edwin Duckworth FY 79 $206,160
THE FREDERIC BURK FOUNDATION FOR EDUCATION FY 77 356,700
California State University
75 Southgate Avenue
Daly City, CA 94015

"A Lecture and Media Series on Energy"
"Lecture and Media Series on: 'Basic Energy Resources'"
"Comprehensive Lecture and Media Series on: 'The Global Ocean'"

This series of lecture projects, demonstrated the potential of a format that combined travelling lectures with an array of ancillary activities that attracted large audiences and stimulated extensive print and electronic media coverage. The lectures on ocean resource development, for example, attracted an audience of 30,000 persons (largely "blue collar") and reached a far larger audience through coverage by press and broadcasting. Two locations found it necessary to repeat the lectures each night in order to accommodate the attendance.

The impressive response resulted from an elaborate array of supporting activities—press conferences, special luncheon meetings with local businessmen and government officials, related exhibits and displays, parallel courses and lectures in museums and colleges, etc. In every way possible the lectures were treated as the centerpiece of an elaborate "event" which was itself newsworthy. In addition, lectures were extensively illustrated and were re-written by professional journalists for use as "op-ed" materials

in a number of newspapers. There was even successful experimentation with re-packaging of the lectures as a newspaper "Sunday Supplement."

Speakers were chosen for their popular recognition and appeal, and throughout the process presentations and materials were developed under the review and guidance of an expert advisory panel, chosen to assure balance, objectivity and accuracy.

The response to this early series led to experimentation with the less "glamourous" topic of energy resources. Attendance was reduced but media coverage increased significantly. A later effort to replicate the west coast experience in other regions was not encouraging and PUOS has concluded that this project offers an important model for a public understanding program—but its success depends upon a critical combination of topic, public interest, community participation and cooperation, and astute and skilled management.

Catherine Streibert FY 79 $14,408
KCET/COMMUNITY TELEVISION OF SOUTHERN CALIFORNIA
4401 Sunset Blvd.
Los Angeles, CA 90027

"A Study of Science Program Potential for Pay Television"

Over 20 percent of the television audience now receives programs via cable television. A rapidly growing portion of this group receives pay-TV programs, and some stations are experimenting with over-the-air pay systems. If such systems were to include public interest materials such as science programs, they might offer an important new dissemination pattern which would be both responsive to viewers and to some extent self-supporting.

This project explored the potential for science programming to pay-TV audiences. During a six-month period, interviews and surveys were conducted to identify current science programming and to determine the interest of existing pay program suppliers, distributors and exhibitors in science programming. It attempted to identify the kinds of parties that might be interested in science programs and the range of prices and conditions of purchase which might be encountered. Economic and legal barriers were examined. A summary report is available from the Office of Scientific and Engineering Personnel and Education.

James A. Fellows FY 79 $9,250
NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036

"Analysis of Collaborative Media Production Projects"

This project reviewed the history and accomplishments of several collaborative science production efforts within public broadcasting. The staff used both formal records and interviews with producers and executives as the basis for an analysis of the opportunities and problems of such collaborative production arrangements.

George Gerbner FY 79 $10,001
UNIVERSITY OF PENNSYLVANIA
School of Communications
Philadelphia, PA 19104

"An Exploratory Study of the Presentation of Science on Television"

This project was a small exploratory study of the presentation of science in entertainment television programs during the past decade. The project used the University of Pennsylvania's large computer file describing programs over the past eleven years, to analyze the content and "role models" of science and scientists as presented in dramatic programs. Preliminary examination has shown that more than half of such programs involve some science related theme, and science/technology is a major theme in about 5 percent of the programs. This exploration was intended to provide greater insight into the popular impressions of science and scientific occupations.

David Challinor FY 78 $35,169
SMITHSONIAN INSTITUTION FY 77 34,000
Washington, D.C. 20560

"Key Issues in Science Today"

This project presented a series of lecture-debates on science issues related to contemporary public policy. The series was presented by the Resident Associates Program, and topics for the debates were identified by an advisory panel of experts from the Smithsonian, the National Academy of Science, Department of State and Agency for International Development. The sessions reached a large secondary audience through broadcasts by Radio Smithsonian, National Public Radio, and Voice of America—and through articles in journals and magazines such as "Time" and the *New York Times*, as well as Research Reports, a bi-monthly Smithsonian publication, and the *Smithsonian* Magazine.

Robert P. Larkin FY 78 $43,040
UNIVERSITY OF COLORADO AT COLORADO SPRINGS
Austin Bluffs Parkway
Colorado Springs, CO 80907

"Science and the Elderly: An Informal Instructional Program on Energy and the Environment"

The University of Colorado developed a model program of informal education for local senior citizens concerning geology, natural resources, energy development and regional environmental concerns. The project capitalized on the knowledge and vitality of the many retired

scientists in the area as presentors and directors of instructional activities. The program included workshops, seminars, discussions, demonstrations and field trips to research laboratories, energy industries and other technical facilities.

Joan N. Warnow FY 78 $4,700
AMERICAN INSTITUTE OF PHYSICS
335 East 45th Street
New York, NY 10017

"An Audio-visual Catalog for the Einstein Centennial"

In an earlier project, the American Institute of Physics established a library of pictorial materials related to the history of modern physics. Since 1979 was the centennial of Einstein's birth, there was a substantial increase in requests for related materials. This project developed a special catalog of such materials in a format which will be helpful to potential users.

Letitia Lestina FY 77 $17,000
ILLINOIS SCIENCE LECTURE ASSOCIATION FY 76 6,000
880 Lake Shore Drive
Chicago, IL 60611

"The Christmas Lectures"—A Series of Science Lectures in Chicago, Illinois

The Illinois Science Lecture Association presented a series of annual Christmas lectures by leading scientists to audiences of talented young people and parents in the Chicago area. These lectures were modeled after the famous "Christmas Lectures" of Michael Faraday in London. Speakers for this program included Professor Brian Hartley, Imperial College, London; Professor Theodosius Dobzhansky, Department of Genetics, University of California, Davis; Professor Sol Spiegelman, Director, Cancer Research Institute, Columbia University; and Dr. Charles E. Oxnard, Dean of the College, University of Chicago.

Stephen Stern FY 77 $36,400
OTRABANDA COMPANY 1,000
301 Pacific Avenue
New Orleans, LA 70114

"Glass," a Dramatic Presentation Concerning Scientific Method and the Process of Discovery

Conventional communication techniques tend to reach an audience already motivated to science. This project experimented with means to reach a new audience through the use of a theatrical presentation. The group dramatically depicted a scientifically and historically accurate presentation of the evolution of a major scientific discovery, the development of transparent glass, illustrating both the processes of scientific discovery and the consequent impact of such a discovery on both the scientific community itself and on society in general. The performances were well received and were later tested as an unusual form of "travelling exhibit" for science museums under the auspices of the Association for Science and Technology Centers.

Alan McGowan FY 77 $20,000
SCIENTISTS' INSTITUTE FOR PUBLIC INFORMATION
355 Lexington Avenue
New York, NY 10017

Planning Grant for "Science and the Inner City Environment"

This grant supported an effort to explore the potential utility of public presentations related to the environmental problems of inner city communities. SIPI explored the possibility of establishing cooperation with a council of leaders from local organizations within each New York city community.

Dixie Ann Pemberton FY 77 $39,200
UNIVERSITY OF MARYLAND
College Park, MD 20740

"Information Training to Make Citizen Advisory Groups more Effective"

An education specialist from the University of Maryland worked with several citizens' groups and a board of county commissions to enhance their ability to define technical problems and interpret scientific and technical information from a variety of university, Federal and state information resources. The project tested the cooperative effort as a potential model for similar citizens' groups and government agencies.

William A. Blanpied FY 76 $194,000
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005

"Core Programs to Promote a Critical Awareness of Science and Technology in American Society"

The American Association for the Advancement of Science undertook a three-year comprehensive program to focus public attention on issues with significant scientific and technical components.

The program included regional seminars and workshops on issues related to food, energy and environment; mass media internships for young scientists with print and broadcast media; workshops on science for newspaper reporters and editors and a critical science film reviewing service aimed at increasing the utilization of science films. Additional funds for the program were received from the Ford and Russell Sage Foundations.

Lynton K. Caldwell FY 76 $36,860
INDIANA UNIVERSITY
School of Public and Environmental Affairs
Bloomington, IN 47401

"Partial Support for a Major Public Conference on Marine Science Research, Bloomington, Indiana"

Leading experts from around the world in the physical, natural and behavioral sciences were brought together along with concerned citizens and public leaders to discuss current scientific research on the ecology, behavior and significance of marine mammals in the ocean ecosphere. The individual presentations at this conference were broadcast nationwide through the facilities of the National Public Radio Network.

John L. McKnight FY 76 $23,300
COLLEGE OF WILLIAM AND MARY
Williamsburg, VA 23185

"Restoration of 18th Century Scientific Apparatus and Public Lecture Demonstration: A Bicentennial Science Project for Williamsburg, Virginia"

The physics of objects of common everyday experience caught the interest of our forefathers as much as it does to us today—and many concepts of physics can be clarified through a historical discussion. In an attempt to exploit this potential while at the same time exploring the place of science in the era of the American Revolution, faculty at the College of William and Mary recreated 18th century lectures of the type widely delivered to general audiences in which the "Newtonian Philosophy" was expounded and explained by demonstrations. The College purchased and restored or reconstructed a selection of physics demonstration apparatus such as those which might have been available in the late 1760's. Using books published by the best known of the popular lecturers of that era, a recreated lecture was written and staged with appropriately costumed personnel. The lecture was presented at Williamsburg and videotaped for school use.

Raymond J. Seeger FY 76 $52,000
SOCIETY OF THE SIGMA XI
The Scientific Research Society of North America
4507 Watherhill Road
Washington, D.C. 20016

Bicentennial Lecture Program on "Science and Society"

The Society of the Sigma XI, a nationwide honorary scientific society, conducted a Bicentennial-related series of interdisciplinary lectures by leading scientists at over 80 small and medium-sized colleges and universities across the country. These lectures focused on the sociological-philosophical aspects of science and technology from the historical perspective of their development in the United States.

John R. Craig FY 76 $5,000
UNIVERSITY OF DENVER
University Park
Denver, CO 80210

Partial Support for a Conference on "Alternatives for the Rocky Mountain West—Colonization or Self Determination, Vail, Colorado"

The University of Denver, Denver Research Institute, in cooperation with the Town of Vail, Colorado, conducted a public conference on the scientific and technical aspects of resource and development alternatives in the Rocky Mountain region. Additional support for the conference was provided by the Federal Energy Administration, the Energy Research and Development Administration, the Old West Regional Commission, the Environmental Protection Agency, and the Department of the Interior.

Vol Del Chamberlain FY 76 $18,700
AMERICAN ASTRONOMICAL SOCIETY
211 FitzRandolph Road
Princeton, NJ 08540

"Astronomy in the Parks"

In cooperation with the National Park Service, the American Astronomical Society developed and conducted a unique educational program for park rangers and naturalists on sky interpretation for the park visitor. Special educational materials were developed and were conducted in training sessions in astronomy for park personnel in over 50 parks across the country. At the conclusion of this project, the National Park Service integrated sky interpretation into its regular training program for park personnel, so that visitors can learn more about the universe while enjoying the spectacle of the night sky.

William Maass FY 76 $180,445
EXECUTIVE VIDEO FORUM, INC.
Suite 303 East
200 Park Avenue
New York, NY 10017

"KNOWLEDGE: 2000—An Exploration of the Knowledge Capabilities Required to Meet the Challenges of the Next 25 Years"

The National Science Foundation developed three international symposia entitled, "KNOWLEDGE: 2000—An Exploration of the Knowledge Capabilities Required to Meet the Challenges of the Next 25 Years." The project, co-sponsored by NSF and the Xerox Corporation, focused an organized intellectual effort on identifying important areas of knowledge, and major issues confronting the world at the outset of our Nation's third century.